STRATEGIC MARKETING FOR URUGUAYAN *EUCALYPTUS* SOLIDWOOD PRODUCTS

A thesis

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List of common and scientific names of species included in the thesis

Common names are given in English and in Spanish (within brackets)

American cherry, black cherry (cerezo)	*Prunus serotina*
Beech (haya)	*Fagus silvatica*
Ipê (lapacho)	*Tabebuia spp.*
Jarrah	*Eucalyptus marginata*
Jatoba, Brazilian cherry	*Hymenaea courbaril*
Mahogany, African	*Khaya spp.*
Mahogany, Philippine	*Shorea spp.*
Mahogany, true (caoba)	*Swietenia spp.*
Maple (arce)	*Acer spp.*
Merbau	*Intsia spp.*
Meranti	*Shorea spp.*
Radiata pine	*Pinus radiata*
Red alder (aliso rojo)	*Alnus rubra*
Red gum, river	*Eucalyptus camaldulensis*
Red gum, forest	*Eucalyptus tereticornis*
Red oak (robles rojos)	*Quercus spp.* (inc. *Q.rubra)*
Rose gum, Flooded gum	*Eucalyptus grandis*
Rosewood	*Fugyvious curujivyneous*
Rubberwood	*Hevea brasiliensis*
Santos mahogany	*Myroxylon balsamum*
Sapelli (sapele)	*Entandrophragma cylindricum*
Shining gum	*Eucalyptus nitens*
Silver beech	*Nothofagus menziesii*
Southern blue gum	*Eucalyptus globulus*
Sydney blue gum	*Eucalyptus saligna*
Teak (teca)	*Tectona grandis*
Walnut (nogal)	*Juglans spp.*
White oak (robles blancos)	*Quercus spp.*

Abstract

Uruguay is a relatively small country by international standards both in land area and in population. In the late 1980s, the government of Uruguay decided to establish plantation forestry and to provide for new industry business development, with rural employment opportunities. An incentive programme was established to subsidise planting costs and a future commitment made to importing processing equipment with duty exemptions.

The planting programme has been successful. Today there are 616,000 hectares planted, of which 424,000 are *Eucalyptus* forests. But Uruguay has had no forestry culture. The issue is one of looking at future projections and anticipating future requirements for developing markets and marketing programmes, a missing ingredient in the current programmes.

This study addresses the situation in the Northern Department of Rivera. Here there has been highly intensive management implemented to *Eucalyptus grandis*. The questions concern availability and likely product-markets for a lesser-known hardwood species. The issues are how to access these markets and achieve value for new hardwood products. There is some experience developing with plantation *Eucalyptus* but only for the largest international marketer, Weyerhaeuser. This questions the need to review the market opportunities for landowners growing solidwood *Eucalyptus* to avoid a commodity approach selling into SE Asia.

The identified value-adding product opportunities include furniture and flooring. The species attributes are shown to meet product-market requirements in international markets. General hardwood trends are identified which support more hardwood production and sustainable products from plantations. Recommendations are offered for market positioning and branding Uruguayan *Eucalyptus* products. Two parallel New Zealand case studies are cited in support of the recommendations. The question is one of raising the sights to achieve market objectives early on and developing a national, industry and company approach to achieve these objectives. This requires both investment and commitment.

CHAPTER 1

This chapter presents an introduction to the research issues and the thesis objectives. Finally, the methodology that was followed during the research is explained.

1.1 Introduction

During the last 15 years a plantation forestry sector has been established in Uruguay thanks to governmental promotion of planting, inherent environmental conditions and relatively low production costs. Plantation forests of *Eucalyptus* and *Pinus* species have shown outstanding growth even in low productivity soils. *Eucalyptus* is the major genus been planted for pulp and latterly for commercial timber purposes. The forestry sector is expected to expand with international-scale participants playing an important role.

Forestry companies are now facing the challenge of being part of a non-traditional sector with governmental planting support nearing expiry, in a competitive context and a changing international forest market. In addition, Uruguayan forest exports are based on commodity products, with prices driven by the international market. However, Uruguay leads the world in intensively managed plantations of *Eucalyptus grandis*. Aggressive silvicultural regimes with early tending, open stands and short rotations characterize the *Eucalyptus grandis* management regimes implemented by some pioneer Uruguayan companies that are producing high quality clearwood. This resource presents outstanding opportunities for high value utilization options.

In spite of this optimistic view and the competitive advantages of Uruguay as a *Eucalyptus* grower, industry marketing activities have been minimal. The focus of government support has been on how to grow trees and now attention has turned to processing facilities, infrastructure and logistics but marketing these forest products has received no attention with the exception of Weyerhaeuser (USA). Seemingly this is due to the lack of a national forest tradition, a largely commodity product orientation and the absence of research or, more fundamentally, university level programmes in forest products marketing. Moreover, there are limited volumes of clearwood and higher grade industrial timber available; as the resource is relatively immature. Strategic marketing for *Eucalyptus* solidwood products appears critical for the successful development of the sector. This study will address marketing strategies for the developing *Eucalyptus grandis* plantation resource.

1.2 Thesis objectives

This project aims to:

(i) Describe the international hardwood market: product trade and trends.

(ii) Identify key potential solidwood products/markets possibilities for Uruguayan *Eucalyptus grandis*.

(iii) Propose marketing strategies to assist the government and *Eucalyptus grandis* industry build a competitive and highly differentiated export-oriented sector.

The marketing lessons and strategies resulting from the study could be, to some extent, applied to the pine and other eucalypt species that are grown in Uruguay. It is likely that the research has importance to the overall Uruguayan forest economy, reinforcing the role of marketing for achieving a differentiated forest industry.

1.3 Study methodology: marketing and research issues

According to Kotler (2004) marketing is a process influencing organizational strategy. The theoretical framework is that marketing is an integral part of strategic planning process for an organization, whether a company or industry grouping or a national planning body. The organization starts with a mission of its purpose along with the objectives to be achieved in a specific period of time. Strategic marketing relates to longer term objectives and scenarios, 5 years or longer.

The central point is building strong and lasting relationships with customers that will be profitable. The first step is market research to identify products and markets, starting with international end-use applications. This research identifies the total market and then divides it into segments related to specific areas of application. The next step is to select and focus on smaller segments within the overall market.

This selection of segments involves three steps: segmentation, targeting and positioning. It includes establishing market groups of customers with similar buying responses and product distribution requirements, such as high-value furniture manufacturers. The preferred marketing groups are described as "targets" for marketing activities. Within these group segments, the organization decides how to place its products relative to other competitors and other substitute products. It also must identify comparative advantages for its position vis a vis competitors. Most often the positioning is incorporated into a brand name that helps communicate the product benefits or value-proposition (specific customer benefits). This basic framework provides the basis for the product research and the strategic analysis in the thesis (Chapter 6).

Today, companies must be "customer centred" to be successful. This places greater dependence on appropriate marketing. Several case studies are referenced that confirm the marketing framework and principles. In addition to the appropriate product/market combinations, organizations must be better than their competitors in servicing target customers. This involves designing successful competitive strategies. Typically, the management texts classify four categories: market leader, market follower, market challengers and market niche strategies. It is evident that the Uruguayan *Eucalyptus*

segment is small compared to global markets. The underlying assumption is a niche market approach. At the same time there is a major regional supplier distributing a similar product from Brazil and setting a high quality marketing programme. Hence, it follows that the preferred competitive strategy is one of a "market-niche follower".

Following from this marketing overview, the theoretical approach comes back to planning the marketing mix involving the 4 P or the 4 C approach. The marketing mix is the set of controllable, planned marketing tools that should be combined to influence the product demand in the target market and consists of the group of variables:

- Product (or Customer Solution)
- Price (or Customer Cost)
- Place (or Convenience)
- Promotion (or Communication)

These variables involve more detailed planning following from the framework just described. Chapter 6 includes recommendations on Product alternatives and attributes (including certification, substitution opportunities and brand naming), Price (including price references, pricing policy), Place (including distribution and partnership across the supply chain) and Promotion (including push/pull strategy, promotional programme and promotion of the intangible values).

Research methodology

Figure 1.1 outlines the research topics.

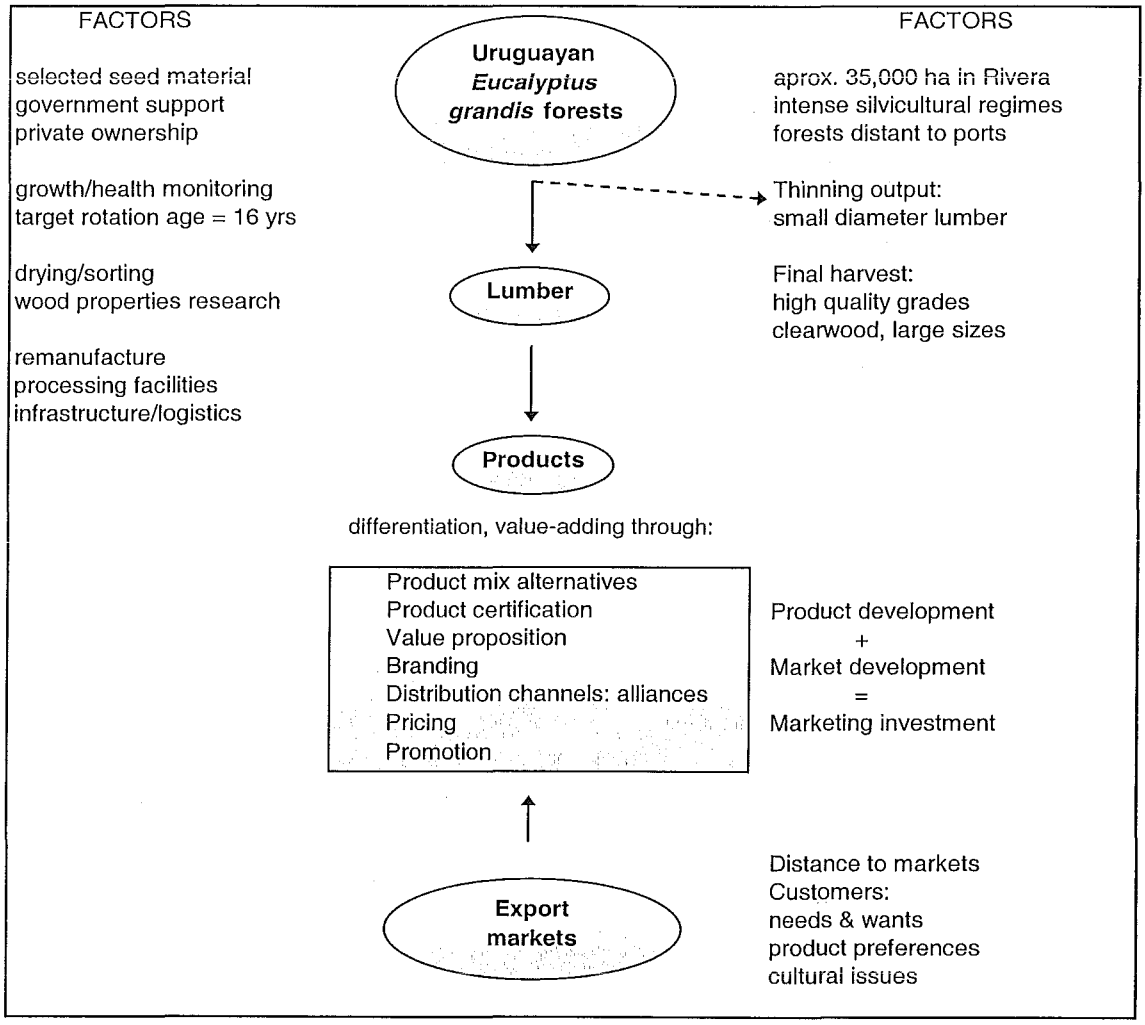

Figure 1.1 Diagrammatic representation of the research topics.

The process through which this study is conducted is summarized as follows:

- CHAPTER 2 (a). Overview of the international hardwood markets. This section will cover the major regions that demand hardwood products, including sawn wood, furniture and builders' joinery and carpentry products. Socio-economic and environment changes will be considered. Trade trends will be reviewed in order to identify potential product and market opportunities for the developing Uruguayan *Eucalyptus* industry.

- CHAPTER 2 (b). Overview of the global *Eucalyptus* industry. This exercise will consider the current status of the *Eucalyptus* industry, including plantation area, lumber supply and producers by product segment and country. It will also include product and market segments receptive to plantation solidwood *Eucalyptus* products.

- CHAPTER 3. Analysis of the Uruguayan *Eucalyptus* sector. The issues to be considered are species composition, area of plantations, regional distribution of the forests, silvicultural regimes, industry structure, processing industries, export products, markets and prices. Particular emphasis will be given to *Eucalyptus grandis*, the only species that is being managed for solidwood products.

- CHAPTER 4. Forecast volume supply from *E. grandis* solidwood plantations in Uruguay. This step includes estimating current standing volume and merchantable volume profiles (by log type) over time both at a stand level and estate level. The estate level will include 32 000 hectares of highly managed *E. grandis* plantations that are located in soils type 7, Northern Uruguay. Volume will be estimated for a selected tending regime and for different harvest age simulations. Output volumes will be an indication of current and future, unpruned and pruned, *E. grandis* log supply for Northern Uruguay for the period 2002-2018.

- CHAPTER 5. Characterization of the wood properties of Uruguayan *Eucalyptus grandis*. An assessment of the timber properties is needed for product development, genetic breeding and marketing programmes. Information on the physical, mechanical and technical wood properties for *E. grandis* in Uruguay will be compiled from national research studies. Average values for the species wood density, Modulus of Elasticity, Modulus of Rupture and Janka hardness will be presented. A summary table will provide

average values of the main wood properties for *E. grandis* in Latin America (plantation-grown forests) and Australia (natural forests). A wood properties comparison with selected (non *Eucalyptus*) commercial hardwoods will support marketing recommendations on product mix alternatives, substitution opportunities and species positioning included in Chapter 6.

- CHAPTER 6. Apply a theoretical marketing framework and formulate strategic marketing recommendations for the export oriented Uruguayan *Eucalyptus* solidwood industry. Recommendations will involve likely product attributes, market research, segmenting, positioning with value-attributes and likely promotion activities. The development and marketing of intangible values and branding will be part of the evaluation.

Selected international companies where new product-market development is underway by means of marketing theory will serve as cases in point. Case studies include the following companies: Weyerhaeuser (United States based company), New Zealand Merino and Tenon (New Zealand). Case studies will also include Aracruz Produtos Madeiras (Brazil) and Zenia House (Denmark) as allied companies to Weyerhaeuser and Tenon.

- CHAPTER 7. General discussion, conclusions, limitations of the study and further research.

CHAPTER 2 OVERVIEW OF INTERNATIONAL HARDWOOD MARKETS

2.1 Introduction and chapter outline

This chapter briefly presents the international trade in value-added hardwood products. The objective of the chapter is to provide a figure of the major changes that have occurred in the international forest product markets in order to identify potential opportunities and threats for Uruguay as a *Eucalyptus* exporter. It will also assist in developing the product mix alternatives and strategic-market planning that motivates this research study. The information presented in this chapter is intended to support the marketing recommendations included in Chapter 6.

The chapter is divided into two sections: 1) product/market trends for wooden species in general, and 2) product/market trends for *Eucalyptus* in particular. The first section presents UNECE/FAO statistics on global imports of secondary processed wood products[1] (SPWP) by product group and markets. Attention is then focused on the United States (US), a major player in the global SPWP trade and a hardwood importer, including *Eucalyptus*. An overview of the Asian markets will expose the growth of China and South East Asia as low-cost manufacturers of SPWP. The Asian furniture industry serves as a case in point.

Section two introduces the global *Eucalyptus* industry and main producer countries. Actual and projected lumber supply for *Eucalyptus* is shown. Growth in *Eucalyptus* lumber production is expected to be from plantations, including Uruguay. *Eucalyptus* substitution for tropical species has started taking place and international examples are presented.

The international scenario offers diverse opportunities for Uruguayan *Eucalyptus* growers and producers. These are presented in the conclusion section.

[1] SPWP include furniture and builder's joinery and carpentry (BJC). BJC include the following product segments: doors, windows, shingles and shakes, others.

2.2 International hardwood markets

2.2.1 Sawn wood markets

Statistics on global trade of primary processed wood products (PPWP) show an increasing trend in hardwood sawn wood trade over the 31 year period 1970-2001 (Figure 2.1). Over the last decade, trade in hardwood sawn wood (global imports) has increased by an average of 3.8% per year. Global production of hardwood sawn wood did not follow the same trend over the last decade and has fallen by an average of 1.9% per year. For the year 2001 production was 106 million m^3 and imports were 22.5 million m^3 (Donnelly & Flynn, 2004).

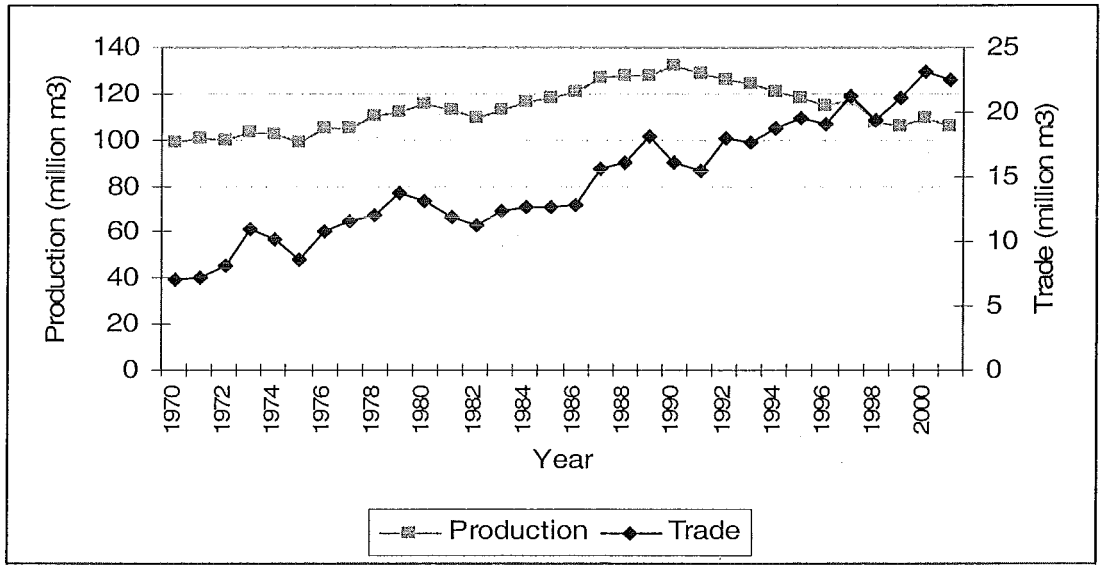

Figure 2.1 Global production and trade in hardwood sawn wood.
Source: Donnelly & Flynn (2004).

The major import markets for hardwood sawn wood are presented in Figure 2.2. As can be seen, all import markets have grown rapidly in the last half of the 1990s. Europe is the major import market for hardwood sawn wood, growing more than 30% since 1995. Italy accounts for 25% of European imports. China imports more hardwood sawn wood than North America (Donnelly & Flynn, 2004).

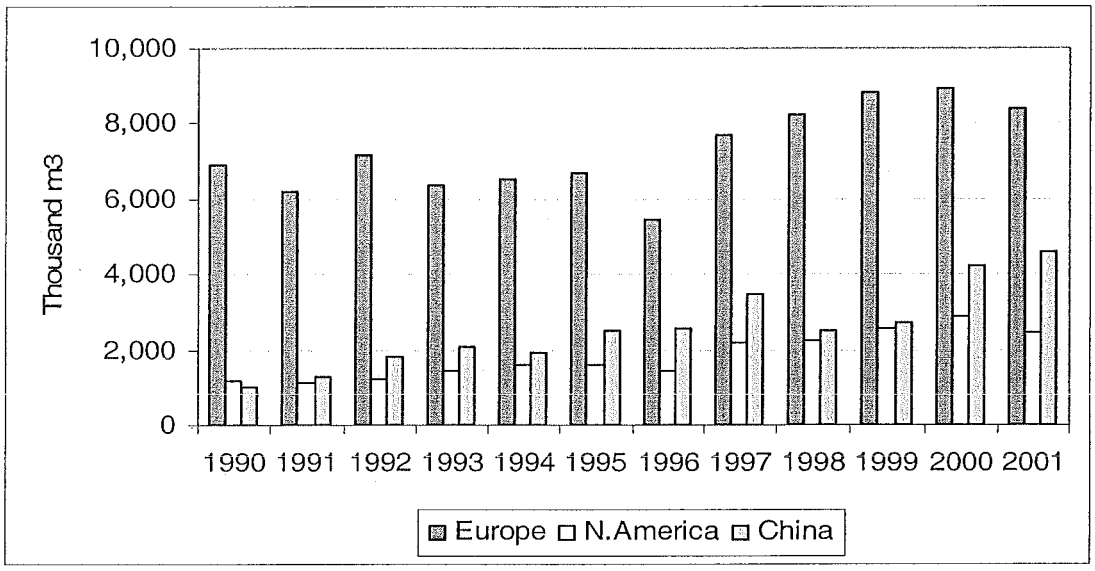

Figure 2.2 Hardwood sawn wood import volume, 1990-2001.
Source: Donnelly & Flynn (2004).

Uruguay supplies sawn wood for overseas SPWP industries (i.e. a "commodity" exporter). Uruguay has trade flows of hardwood sawn wood with Europe, Asia and the US (Table 2.1). All hardwood exports from Uruguay correspond to plantation-grown *Eucalyptus*. Italy is the main importing country followed by Japan and more recently Indonesia. For 2002, import values for Italy, Japan and Indonesia were US$ 1,544 thousand, US$ 751 thousand and US$ 722 thousand respectively (Rimoldi, 2003). Some East and South East Asian countries have started imports of Uruguayan *Eucalyptus* sawn wood in the late 1990s. This includes Indonesia, Taiwan, Vietnam, Thailand, China and Malaysia. Additionally, the US (a traditional importer of pine timber from Uruguay) started importing *Eucalyptus* sawn timber from Uruguay too.

As will be presented in the next sections, many of the countries that import Uruguayan *Eucalyptus* sawn wood are large furniture manufacturers and exporters. It is difficult to track the final product that Uruguayan *Eucalyptus* sawn wood will be processed into. SPWP may remain in the manufacturing country or be re-exported (e.g. Asian *Eucalyptus* products from Latin America raw material, exported to Europe and the US).

Table 2.1 Evolution of Uruguayan *Eucalyptus* sawn wood exports by country of destination, 1996-2002 (US$).

	1996	1997	1998	1999	2000	2001	2002
Italy	5,870,807	2,859,546	3,581,799	2,824,216	1,254,082	762,320	1,544,330
Japan	239,815	1,445,814	823,636	544,394	737,803	915,066	750,550
Indonesia						63,419	721,848
Taiwan					4,202		287,932
Argentina			46,138	101,856	100,271		
US		3,753	30,870	76,251	21,084	96,734	16,551
Spain		19,109	14,976	26,491	76,136	15,687	49,648
Vietnam					6,260		157,741
Mexico							93,375
Belgium							57,890
South Korea	31,856			24,730			
Thailand			23,865		15,048		
China							22.513
Germany				19,034			340
Canada			18,858				
Holland							18,120
Portugal							16,375
Malaysia						4,550	11,458
France		12,916					1,187
Chile	600		10,666				
Brazil			8,500				1,800

Source: Rimoldi (2003).

2.2.2 Secondary processed wood products markets

Another trend in global forest products trade is the gradual increase of value-added, SPWP[2] share (UNECE/FAO, 2004). World imports for value-added products of furniture and joinery in 2002 were considerably higher than those reported for 1998 (Figure 2.3). In value terms imports of wooden furniture have gradually increased reaching about US$ 37 billion in 2002; this is about 30% above 1998 and 10% above 2001 values. Little change in the structure of trade between furniture categories has taken place since 1998. Imports of builder's joinery, carpentry (BJC) and profiled wood increased reaching about US$ 9.5 billion; almost 20% above 1998 and 8% up from 2001. The wooden window segment also increased (UNECE/FAO, 2004).

[2] Value-added and secondary processed wood products (SPWP) will be used as equivalent.

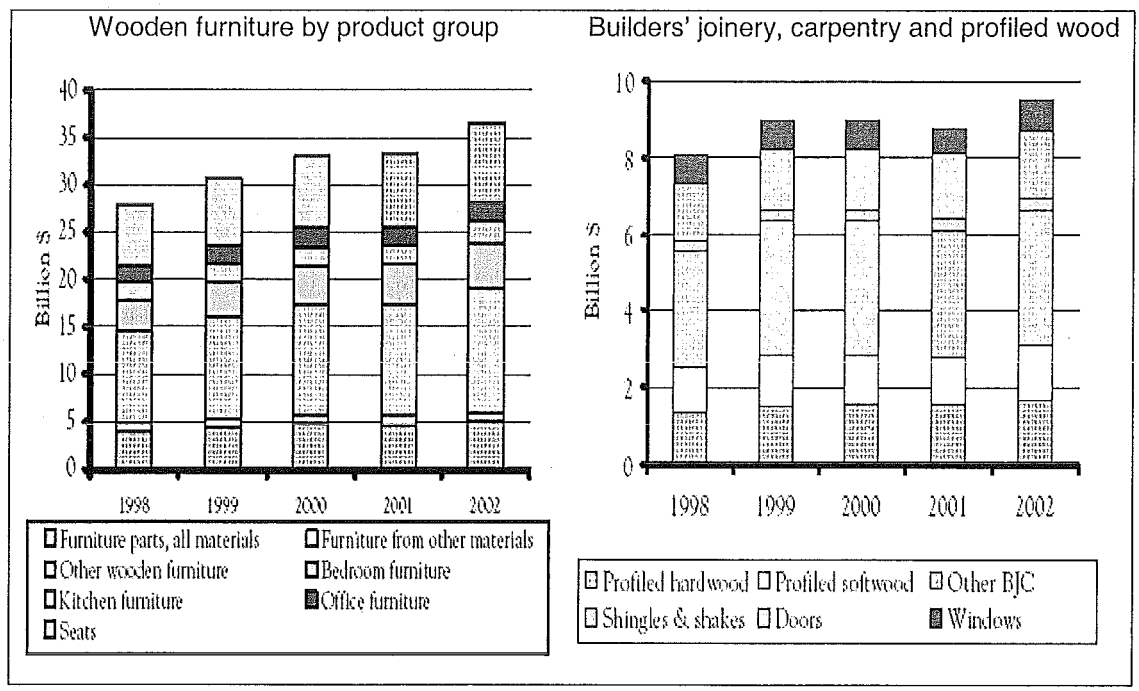

Figure 2.3 World imports of value-added wood products by product group 1998-2002.

Source: UNECE/FAO (2004).

Notes: Furniture parts from other materials include bamboo, osier and rattan.

$ = United States dollar US$

Furniture markets

Wooden furniture is reported to be the most dynamic sector in the international trade of value-added wood products. It also makes up a significant portion of value-added wood products imports (almost 80% by 2002). Significant changes are underway in the global furniture industry with rising competition on the supply side. Italy and Germany remain the biggest furniture exporters in the world, but some countries in Asia such as China and Taiwan show strong growth prospects. The US, Canada and Japan are large furniture manufacturing countries due to their large domestic consumption.

The US is the world's largest importer of furniture (representing 34% of the world furniture imports in the year 2002), followed by Germany (9%), the United Kingdom (8%), France (6%), and Japan (5%). These represent the world's five top furniture importing countries. Together, these countries imported 62% of global wooden furniture (UNECE/FAO, 2004).

Main exporting regions for the top five importing countries are Asia for the US and Japan and Europe (mainly Italy) for Germany, the United Kingdom and France. Europe has had an average 80% market-share in supplying the three key European importer countries. Eighty percent of Japanese imports are coming from Asian countries. Furniture trade between Asia and Europe is significant. Asia constitutes the second supplier region to Europe while Europe is the second supplier region to Asia (UNECE/FAO, 2004).

The US, as the biggest importer of wooden furniture with considerable growth over the period 2001-2002, merits further analysis. Region of origin of furniture imports to the US are presented in Table 2.2. Asia is by far the most important exporting region led by Indonesia and Malaysia, followed by North America and Europe. The changing market-share for importing regions from 2001 to 2002 shows an increase in Asian market-share from 47% to 54%. This Asian growth trend is expected to continue. The remaining export regions diminished their participation in the US furniture market (UNECE/FAO, 2004).

Table 2.2 Region of origin of furniture imports to the US market, 2001-2002 (%).

Exporting regions	2001	2002	Change
Asia	47.3	53.5	↑
North America	24.5	21.1	↓
Europe	18.9	16.7	↓
Latin America	8.9	8.4	↓
Others	0.5	0.4	↓
Total imports, billion US$	10.7	12.6	↑

Source: UNECE/FAO (2004).

Note: 2001 statistics updated in 2004.

Builders' joinery and carpentry (BJC) markets

In BJC the US was again the largest importer, accounting for 29% of total world imports. After the US, major importing countries were Germany, the United Kingdom, France and Japan (the last two countries with similar values). The top-five countries accounted for 58% of the world imports. The major changes in trade flows of BJC happened in US imports, where North American (Canadian) sources lost ground mostly to Latin American suppliers. Europe and Asia also increased their shares (Table 2.3).

Table 2.3 Region of origin of BJC imports to the US market, 2001-2002 (%).

Exporting regions	2001	2002	Change
Asia	10.0	10.5	↑
North America	67.4	63.7	↓
Europe	6.6	7.3	↑
Latin America	14.5	16.8	↑
Others	1.4	1.7	↑
Total imports, billion US$	1.7	1.8	↑

Source: UNECE/FAO (2004).

Note: 2001 statistics updated in 2004.

2.2.3 The United States: growing dependence on SPWP imports

As presented previously the US is the major market demanding value-added wood products and is expanding. The growth of the US market for value-added products has been due to the nation's strong economy during the 1990s and also because of demographics.

The US furniture segment is an illustration. Furniture imports increased dramatically during the 1990s while US exports have only increased slightly (Figure 2.4). While for the year 1999 US$ 8 billion was reported for furniture imports, there was nearly US$ 2 billion for exports (Bullard & West, 2002). The US remains a significant net importer of furniture. UNECE/FAO (2004) trade data on US furniture imports presented previously confirms the ongoing growth of the nation's furniture imports. Since 1997 import growth was slightly above US$ 1 billion per year, with a US$ 2 billion annual increment evidenced from 2001 to 2002 (Bullard & West, 2002; UNECE/FAO, 2004).

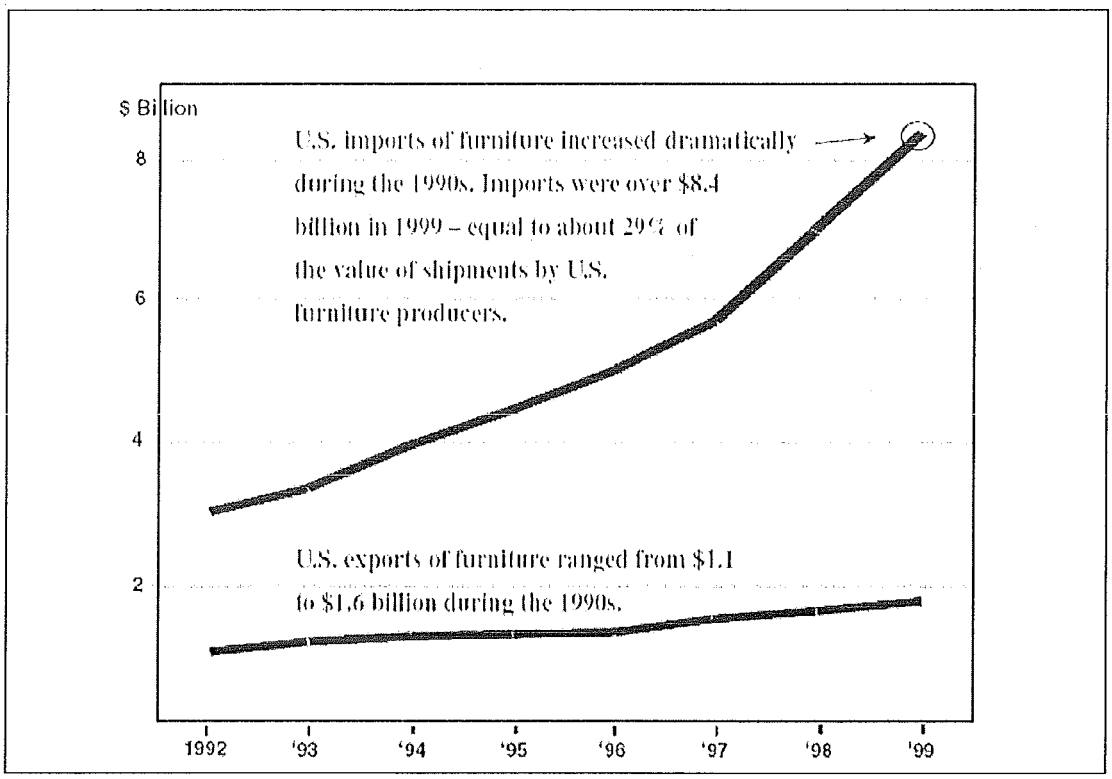

Figure 2.4 US imports and exports of household furniture, 1992 – 1999.
Source: Bullard and West (2002).
Note: $ = United States dollar US$.

Data presented by Bullard and West (2002) on US furniture trade is valuable for visualizing the consumption and production trends (Table 2.4). US furniture consumption in 1992 was US$ 37 billion while the countries' furniture production was US$ 35 billion. In 1999 consumption increased to US$ 46 billion while the domestic furniture production increased to US$ 39 billion. The gap between consumption and production enlarged changing from US$ 2 billion in 1992 to US$ 6.6 billion in 1999. The increase in US furniture consumption was in large part covered by imports.

Table 2.4 US furniture consumption for wooden furniture, 1992 versus 1999 (US$ billion)

	1992	1999
Consumption (C= P + I - E)	37.0	46.0
Production (P)	35.0	39.4
Imports (I)	3.0	8.4
Exports (E)	1.0	1.8

Source: based on Bullard and West (2002).

Figure 2.5 shows the dramatic growth of US Gross Domestic Product (GDP) and furniture demand since the mid 1980s. In constant dollar terms, sales of US furniture and home furnishing were 65% higher in 1999 than they were in 1982. The phenomenon explaining growth in furniture demand during the late 1980s and the 1990s is the aging of US "baby boomers", 66 million babies born in the US between 1946 and 1964 reached peak age classes for buying furniture (Bullard & West, 2002).

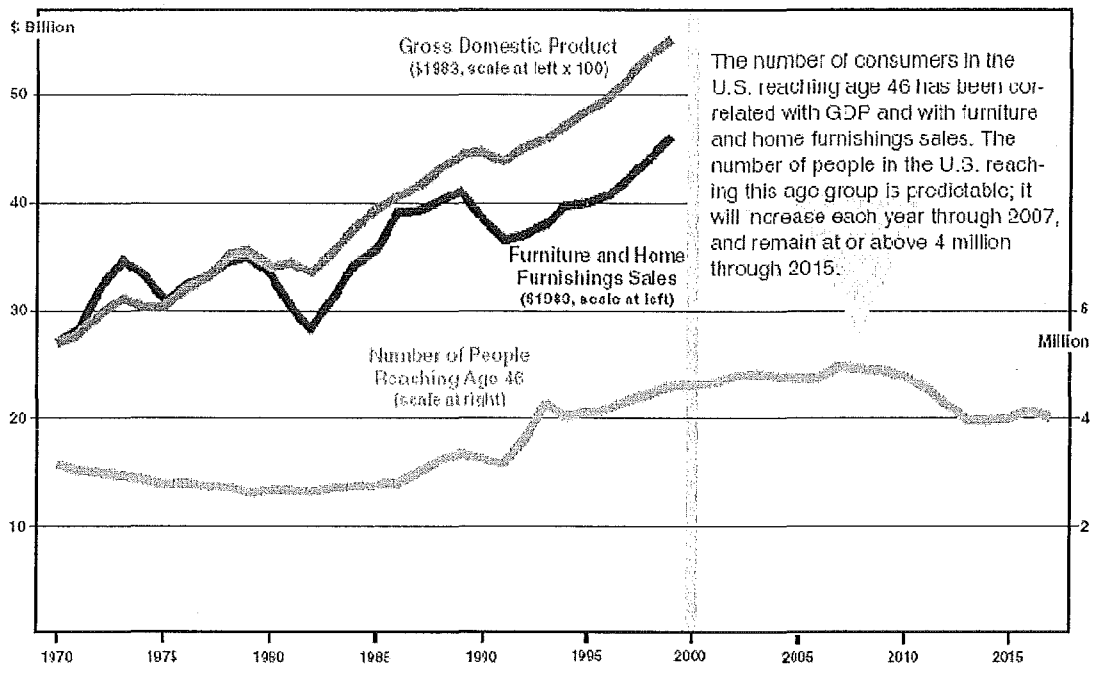

Figure 2.5 United States GDP and sales of furniture in real terms for the period 1970-1999, and the number of people reaching age 46 each year from 1970 to 2017. Source: Bullard and West (2002). Note: $ = United States dollar US$.

The economic expansion of the 1990s is expected to last and so demand will continue for furniture and other wooden products for new homes and home repair/remodelling segments in the US. Demographics will continue to have a strong, positive effect on US GDP and furniture demand in the first part of the 21st century. Fuelled by birth and immigration rates, the number of US consumers reaching the peak spending age[3] is predicted to increase through 2007 remaining at or above the four million level until the year 2015 as shown in Figure 2.5 (Bullard & West, 2002).

[3] The connection between furniture sales and consumers' age in the US is as follows: An average person buys a starter home around age 33-34. By age 46.5 is estimated to own a fully furnishing home. This age is considered the peak spending age for furniture in the US (Bullard & West, 2002).

The US market expansion is a positive trend for markets that export value-added wood products and, in particular, for future Uruguayan manufacturers of furniture and flooring. The US is also geographically close to Uruguay, an advantage when considering freight costs.

2.2.4 Asia: exporter of SPWP

The Asian markets have increased their participation in SPWP trade. Particularly China and countries in South East Asia have emerged as large furniture exporting regions in the world. China has become a booming economy and a key importer of raw material (logs, sawn timber and semi-finished products). In South East Asia Vietnam and Malaysia have became important manufacturers of hardwood furniture for the US and Europe.

The lower production cost (particularly cheap labour) is the primary advantage of the Asian industry. The region, however, supplies "low cost" products and components for the low-end of the market. Products have low value-addition and are in general characterized by unrecognized brands. The South East Asian furniture industry is essentially a large contract manufacturing base (Ratnasingam & Ioras, 2003).

As can be seen in Table 2.5, in spite of the large furniture manufacturing industry in Asia, the level of value addition attained per employee is not comparable to that achieved in more established furniture manufacturing nations such as the US, Italy and Germany. Comparing the value addition per annual cost of employee (VAACE) figures, the Asian countries show the highest values and can be aggregated in three ranges of VAACE. China and Vietnam have the highest VAACE value (88 and 87 respectively), followed by Indonesia and Thailand (42 and 41 respectively) and finally Philippines and Malaysia (20 and 21 respectively). The Asian countries, with low value addition per employee and low daily wage rate show the highest VAACE. On the other hand, Italy, the US, Germany and the UK have VAACE values below 10. The exception in Asia is Taiwan with a notable value addition per employee, wage rates similar to the US and Italy and a VAACE value of 9.5.

Table 2.5 Relative labour productivity rates in different countries, 2000.

Countries	Value addition per employee per annum (US$)	Daily wage rate (US$)	Value addition per annual cost of employee
Italy	95,000	50.0	8.6
US	105,000	60.0	8.0
Germany	87,000	45.0	8.8
United Kingdom	50,000	36.0	6.3
Taiwan	115,000	55.0	9.5
China	29,000	1.5	87.9
Philippines	23,000	5.0	20.9
Thailand	27,000	3.0	40.9
Malaysia	31,000	7.0	20.1
Indonesia	28,000	3.0	42.4
Vietnam	23,000	1.2	87.1

Source: Ratnasingam & Ioras (2003).

Note: Value-addition per employee is the ratio of annual sales to number of direct workforce. Value addition per annual cost of employee was calculated for the purpose of this research as: Value addition per employee per annum/ annual wage. The annual wage considered 220 working days.

One of the problems the Asian furniture industry faces today is the raw material supply. Supply of tropical hardwood logs is becoming more of a problem due to resource constraints in Asia. The sustainability of the Asian furniture industry remains unknown since other cheaper manufacturers may emerge and cheap raw material and labour may become limited. Indeed, raw material costs are getting higher and in consequence production costs are becoming higher too (ITTO, 2004). Sources of supply are shifting to South America, including *Eucalyptus* logs and sawn timber (Donnelly & Ogle, 2004).

For China, ITTO (2004) reported that prices for raw and supplementary materials for furniture manufacture have been increasing in recent years. This also applies to wooden flooring production. The price of lumber is up by about 50%. Prices for supplementary materials (e.g. paint, glue, hardware and fittings), wages and salaries have also increased. The drop in profit margins is severely affecting the Chinese furniture industry (ITTO, 2004).

Viewed from an international perspective, low-value furniture is difficult to sell in major furniture import countries as consumers of developed countries have high incomes and consume imported medium and high-quality furniture. Additionally, the low price Chinese furniture market is saturated, but the market for medium and high price quality furniture still has room to grow. Slowly, China is anticipated to move into the high quality product segment to capture more market-share in the domestic and international markets (ITTO, 2004).

The Chinese flooring industry is facing a better export scenario. China's wooden flooring industry has developed as an integrated industry through 10 years of development. As reported by ITTO (2004) China's wooden flooring products are becoming popular in the international markets.

According to ITTO (2004) statistics, in the first nine months of 2004 China exported 193,000 tons of wooden flooring valued at US$ 240 million. According to ITTO (2004), this is a year on year increase of 77% in volume and 51% in value. During January to September 2004 China exported 57,000 tons of flooring to the US, 47,000 tons to Canada, 19,000 tons to Japan and 11,000 tons of wooden flooring to the UK. Exports of wooden parquet flooring made up 70% of the total.

2.2.5 Markets for certified forest products

There is mounting concern over the environmental credentials of products leading to certified forest products (CFP) being demanded in some "green" product/market segments. Particularly in the developed countries, market reaction to deterioration of the tropical forests with diminishing availability of tropical logs and sawn wood has resulted in a rising consumer resistance to purchase uncertified tropical timber products [4] (Albaladejo, 1998).

This offers increasing substitution opportunities for non-tropical hardwoods. During the late 1990s the growing consumption of American hardwoods and the growth of softwood exports of radiata pine from Chile and New Zealand indicated that substitution from non-tropical timbers was taking place. This trend is expected to

[4] This, however, does not always result in consumers willing to pay a price premium for CFP. Little empirical data is available on the markets for CFP. Studies from around the world found that consumers would be willing to pay a price premium of about 5 to 15%. Environmentally concern consumers tend to be white, urban, better educated and higher in income (Ozanne & Smith, 1998).

continue and even accelerate with the opening of new sources of supply offered by plantation species, principally *Eucalyptus* in Latin America (Albaladejo, 1998). Substitution of tropical hardwood species for plantation-grown *Eucalyptus* is already underway (R. Donnelly, R. Flynn, & E. Shield, 2003b).

Market segments for CFP have been identified in some countries in Europe such as Germany, the United Kingdom and the Netherlands, and also in the US. The US has potential growth opportunities as an importer of CFP. A study conducted on US single-family homeowners identified one consumer segment of approximately 25 million Americans who would most likely seek out CFP (Ozanne & Smith, 1998)[5]. This consumer segment was described as politically liberal, Democrats, female, fairly well educated, concerned about the quality of the environment and the forest resources, members of an environmental organization and having environmental knowledge. Generally, environmentally concerned consumers are higher in socioeconomic status.

[5] As the sample was limited to single-family homeowners, conclusions can only be drawn to the 140 million Americans who are homeowners, not to the US population as a whole.

2.3 Global *Eucalyptus* trends

2.3.1 Progress in higher value utilization

As reported by Donnelly et al. (2003b) the global *Eucalyptus* wood products industry has begun a shift towards higher value utilization products. Plantation-grown products are entering overseas markets with *Eucalyptus* as a hardwood alternative for lumber, veneer, plywood, furniture, flooring and other solidwood products. As plantation *Eucalyptus* is a lesser-known species in the international markets, initial product introduction in 1998 was reported to be difficult partly due to previously unknown market image for quality products (Donnelly & Flynn, 2004).

The shift to higher value utilization is reported to be driven by:

- Decreasing availability of hardwood from traditional sources.
- Oversupply of *Eucalyptus* and low prices for pulpwood.
- Disappointing returns from investment in single-purpose pulpwood projects.
- Advances in genetic breeding programmes.
- Developments in processing technology.
- Environmental concerns and forest certification.

Plantations established in Latin American countries show the fastest growth rates reported for the genus and are increasingly been used for solidwood products. The best species for solidwood products so far is *Eucalyptus grandis*, including hybrids (Donnelly et al., 2003b). Appendix 1 provides indicative forest plantation yields for *Eucalyptus spp.* by country. *Eucalyptus* plantations in Brazil, Argentina, Chile and Uruguay show average annual yield values of 16 to 25 cubic metres per hectare (FAO, 2000). Short rotations allow a fast return on investments for genetic breeding, pruning and thinning that are essential when quality timber is sought.

Eucalyptus plantations are largely concentrated in Brazil. Brazil accounts for 3 million hectares of plantations with known solidwood product production. Uruguayan *Eucalyptus* plantations are of similar size to Australian plantations (Figure 2.6).

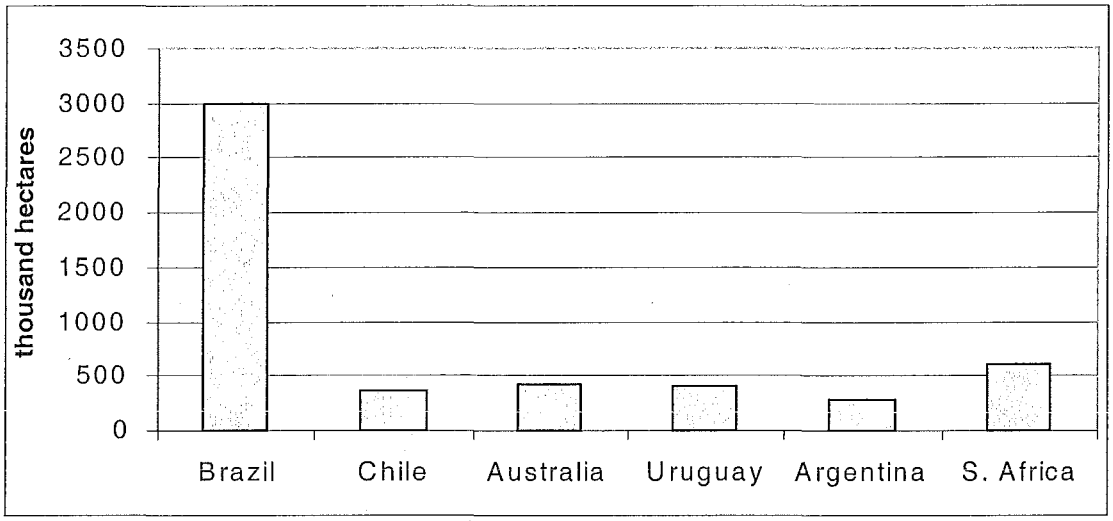

Figure 2.6 Total *Eucalyptus* plantation area for selected countries.
Source: Donnelly & Flynn (2004).

2.3.2 Lumber production and manufacturing industry

Total *Eucalyptus* lumber production is less than 2% of global hardwood lumber and 7% of US hardwood production (Donnelly et al., 2003b). Lumber supply is limited to a few countries: native forests in Australia and plantations in Australia, Latin America and South Africa. Australia is the leading lumber producer supplying half the total eucalypt lumber (Figure 2.7).

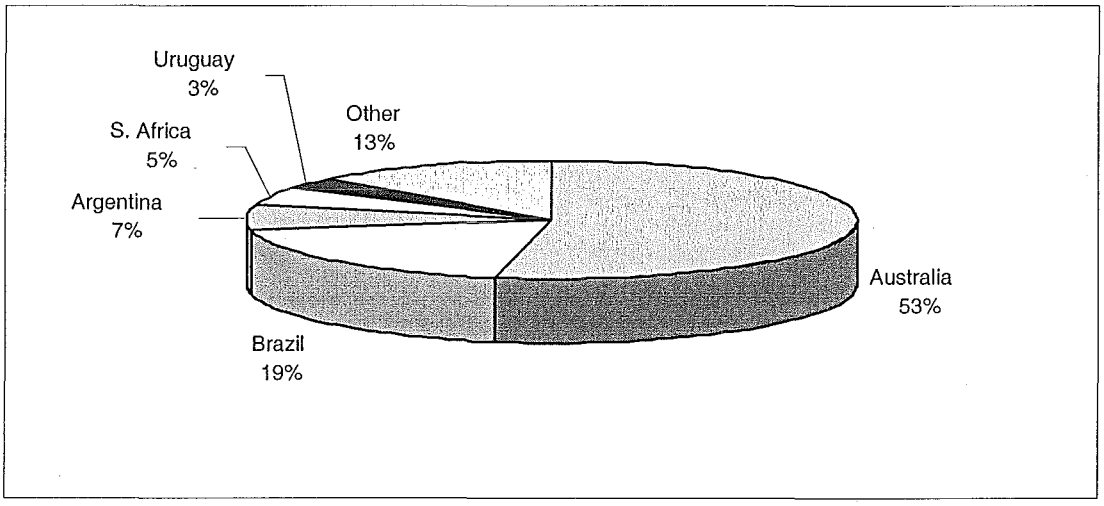

Figure 2.7 Global *Eucalyptus* lumber production, 2002.
Source: Donnelly & Flynn (2004).

As reported by Donnelly et al. (2003b) global solidwood opportunities exist as there is no chance of over-supply in the next 10-15 years. This is due to a restricted supply of

quality sawmill and plywood logs. Supply forecasts conducted by Donnelly et al. (2003b) anticipate the highest *Eucalyptus* sawlog supply to come from Brazil and Uruguay (Figure 2.8).

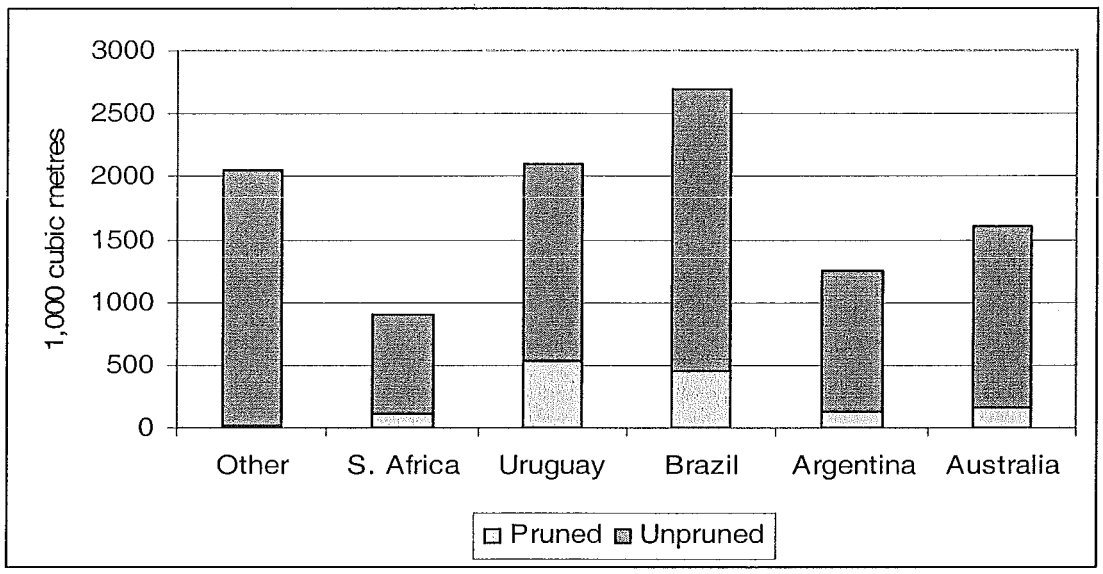

Figure 2.8 Plantation *Eucalyptus* sawlog supply forecast, 2015.
Source: Donnelly & Flynn (2004).

The *Eucalyptus* industry was reported to consist of 83 producers in 1999. The dynamism of the industry is shown by the rapid entry of new producers. By 2003, 450 global *Eucalyptus* producers were identified (R. Donnelly, B. Flynn, & E. Shield, 2003a).

A breakdown of products by manufacturer country is presented in Table 2.6. Data was compiled from *The global Eucalyptus wood products industry: Eucalyptus producers' directory* (Donnelly et al., 2003a). Only products manufactured by four or more companies are included. Almost 150 companies were reported to produce *Eucalyptus* lumber. The manufacture of furniture with *Eucalyptus* was being carried out by 77 companies around the world. Of similar size was the global *Eucalyptus* flooring industry, consisting of 70 companies. The furniture and flooring *Eucalyptus* industry is largely concentrated in Australia, Brazil and South Africa. Manufacturing facilities for *Eucalyptus* furniture are also located in Vietnam (6), Argentina (5), Spain (3), Laos (2), Thailand (1), and China (1). Twenty-three companies were reported to produce *Eucalyptus* plywood while 15 companies were identified as producing moulding (Donnelly et al., 2003a).

Table 2.6 Breakdown of *Eucalyptus* products by manufacturer country.

Country	Number of companies by product segment																
	Bed slats	Decking	Doors	Dowels	Flooring	Furniture	Handles	Hard-board	Logs	Lumber	MDF	Mill-work	Moulding	Pallets	Particle board	Plywood	Veneer
Argentina					4	5		1	5	21	2	1	4	1	4	2	
Australia		6			35	15		1		49	1		5			1	4
Austria					1												
Brazil	2		1	3	6	18	2	2	4	29		2	3	4	2	5	3
Chile					1												3
China						1											
Colombia								1									
Ecuador					1												
Finland					1												
India			1												1	3	
Italy											1						
Laos						2											
New Zealand			1		1					3							1
P. New Guinea										1							
Portugal	1		3		4			1		1		1		1		3	1
South Africa			1	1	3	26	1	1		7	2				1		
Spain	2		2		8	3	1	1		28	1	1	1			8	3
Thailand						1		1		1	3			1			
Uruguay					2					3			1				
USA					4					4			1			1	
Vietnam						6					1				1		
Zimbabwe										2							
TOTAL Co.	5	6	9	4	71	77	4	9	9	149	11	5	15	7	9	23	15

Data was compiled from *The global Eucalyptus wood products industry: Eucalyptus producers'* directory by Donnelly et al. (2003a).

2.3.3 Market entrance through CFP

Certification is identified as a key requirement for *Eucalyptus* solidwood products entry in the international markets. "Green labelled" FSC products from certified *Eucalyptus* forests have been accepted as a substitute for tropical hardwoods in some environmentally concerned markets and product segments.

Certification appears to be key for the US market. Certified *Eucalyptus grandis* plywood has been imported to North American home centres as a substitute for South East Asian lauan. *Eucalyptus* garden furniture, window casing and other products were reported to be accepted in the Northern European Do-It-Yourself (DIY) sector as a substitute for meranti (Donnelly et al., 2003b). Substitution opportunities based on the physical and mechanical wood properties for selected commercial tropical hardwoods are discussed in Chapter 6.

2.3.4 Examples of *Eucalyptus* products introduced to the US market

There is ongoing experience with plantation *Eucalyptus* in Brazil with products being exported to the US. Successful export market initiatives are BR-111 flooring and Lyptus products.

BR-111: Brazilian *Eucalyptus* flooring manufacturer

For more than a decade, BR-111 has been a leader in the introduction of exotic hardwood flooring to distributors throughout the US and Canada where it became the largest importer. BR-111 is also a manufacture leader, with the largest wooden flooring mill in South America. The company's flagship line, Indusparquet, is offered in 3/4" solid unfinished or prefinished tongue and groove clear-grade flooring in a several exotic and domestic species including *Eucalyptus grandis*. The pre-finished *E. grandis* solid flooring (traded as Brazilian *Eucalyptus* or Rose Gum) features a specially formulated UV cured aluminium oxide finish that can be sanded and refinished and a clear grade appearance (BR-111, 2003).

"Lyptus": *Eucalyptus* products

The first marketing effort for plantation *Eucalyptus* is considered to be Weyerhaeuser's positioning of quality *Eucalyptus* lumber Lyptus. Lyptus products include high grade lumber, plywood and flooring. *Eucalyptus* is coming from Aracruz plantations in Brazil and products are manufactured by Aracruz Produtos Madeiras (APM). The Lyptus strategic-market programme includes product research, branding, positioning and marketing alliance. The Lyptus case will be cited in further detail in Chapter 6 as it is considered a guide to the *Eucalyptus* solidwood products industry.

2.4 Conclusions

There is a change in the structure of global hardwood trade. First of all, export market emphasis is shifting from primary (commodity) products to secondary processed products. The growth in imports of hardwood products from Asia, notably in China, for later re-export is significantly affecting both the manufacture of hardwood products and the global hardwood trade.

Additionally, there is an increasing public concern on natural forest conservation. Consumers pursue environmentally certified products with accredited forest management and chain of custody. This offers a competitive advantage for plantation-grown hardwoods over native forest hardwoods (e.g. tropical hardwood, *Eucalyptus* from Australian forests).

Furthermore, the US (world's largest importer of SPWP) is anticipated to continue expanding with increasing potential demand for certified forest products too. Finally, the *Eucalyptus* industry is moving forward the value addition chain entering international markets with SPWP such as furniture, flooring and mouldings. The Brazilian *Eucalyptus* industry has pioneered its market entrance into the US with industry leaders, both Weyerhaeuser and BR-111. Brazilian presence in the US may benefit other countries entry with *Eucalyptus* products (i.e. to follow the leaders, being strategically a "follower").

For Uruguay, the international scenario offers diverse opportunities and threats. The options are: whether to supply *Eucalyptus* sawn wood, a PPWP, and remain a commodity exporter or to supply SPWP value-added products to particular market segments. The first option (commodity option) is already underway. *Eucalyptus* is exported as a brand-less

raw material of un-recognized origin to Europe and re-export markets in Asia. This option is a threat due to the market uncertainties and price fluctuation[6] that characterize the trade of commodity products.

On the other hand, *Eucalyptus* has proved its potential to enter SPWP markets (e.g. BR-111 flooring in the US) and can be a substitute for tropical hardwood in niche markets. Derived from this, research in subsequent chapters was formulated to assist the Uruguayan *Eucalyptus* industry and government shift to value-added exports through strategic market planning (i.e. the second option, value-added option). This includes industry and government investment in manufacturing, product development, market research and marketing activities to support the domestic processing of value-added, certified, Uruguayan *Eucalyptus* products.

[6] Sawn export prices for *Eucalyptus* are presented in Chapter 3.

CHAPTER 3 URUGUAYAN *EUCALYPTUS* INDUSTRY

This section describes the *Eucalyptus* sector in Uruguay. It considers historical trends and the current status of *Eucalyptus* plantation area, silvicultural regimes, main companies and industries relevant to the sector. The emphasis will be on *Eucalyptus grandis*, the only *Eucalyptus* species currently been managed for clear wood production in Uruguay.

Data was sourced from the government forestry agency in Uruguay and industry reports. Personal communication with companies was necessary to collect up-to-date information on the *Eucalyptus* estate by species, tending and intended final use.

3.1 Overview of Uruguayan forest sector

Uruguay lacks a forestry tradition. In the past, trees were mostly used for shelter belts, wind protection, firewood and ornamental purposes in farms and towns. Native forest was and is a limited resource in Uruguay, covering only 3.8% of the total land area. However, since early times, exotic trees from the northern and southern hemispheres were shown to grow fast in the temperate Uruguayan climate. Some species are reported to grow even faster than in their natural area of distribution.

The second Forestry Law (N° 15 939), passed in December 1987, helped the development of the forestry sector. The Forestry Law aimed to promote plantations in areas of low agricultural potential -which have been called "forestry priority soils"- with fast-growing, internationally-known species (Refer to Appendix 2 for a map of Uruguay and location of forestry soils). The Forestry Law encouraged the afforestation of eucalypt, pine, poplar and willow species. Subsidies, tax exoneration and convenient loans were some of the governmental incentives included in the law. The forestry legislation still has a significant impact on the expansion of the sector, in terms of both plantation area and industry development. The incentive programme included in the Forestry Law will be eliminated by the end of 2006. Industry development will still be promoted through tax-free imports of non-locally produced equipment required for lumber processing. This benefit, however, is limited in application to officially approved projects ranked by state interest.

Currently, the national forestry estate consists of 615 613 hectares of commercial plantations. *Eucalyptus* (predominantly *Eucalyptus grandis* and two sub-species of *Eucalyptus globulus*) is the most commonly planted genus (about 72% of the total forest area). Pines (*Pinus taeda* and *Pinus elliottii*) have a 28% share. Although poplar and willow species have also been promoted by the Forestry Law, they have never been relevant in the species mix, representing today less than 1% of the total forest area (Dirección General Forestal MGAP, 2003).

The potential for expansion of the plantation area is still large, since the Forestry Law intends to create plantations on 3.5 million hectares of "forestry priority soils". To date, only 17.6% of that area is occupied by forestry plantations. The forestry estate is projected to increase and may reach a maximum of one million hectares between the years 2008 and 2014 (Dirección General Forestal MGAP, 2002).

3.2 Plantation-grown *Eucalyptus*

Species composition by area

Eucalyptus has been by far the most popular planted genus in Uruguay. By the last quarter of 2003 the total plantation area of *Eucalyptus* was reported as 424 200 ha. As can be seen in Table 3.1, more than half of this area corresponds to *Eucalyptus globulus* species (59% of the total eucalypt plantation-grown area), followed by *Eucalyptus grandis* (36%) and, to a lesser extent minor eucalypt species accounting for 5%.

Table 3.1 *Eucalyptus* plantation-grown resource in Uruguay: gross area by species.

Species	Area (ha)	Percentage
Eucalyptus globulus	249 544	59 %
Eucalyptus grandis	152 132	36 %
Other eucalypt species	22 523	5 %
TOTAL	424 199	100 %

Source: Based on Dirección General Forestal (2003).

Note: Gross area includes non-productive areas such as internal roads.

Historically, *E. globulus* and *E. grandis* were being planted at a similar rate until the mid 1990s. Since then, *E. globulus* has increased its plantation area much faster than *E. grandis* (Figure 3.1). However, since the late 1990s, annual plantation rates for all eucalypt species have decreased; a phenomenon that may likely reflect the slowing and near end of the incentives.

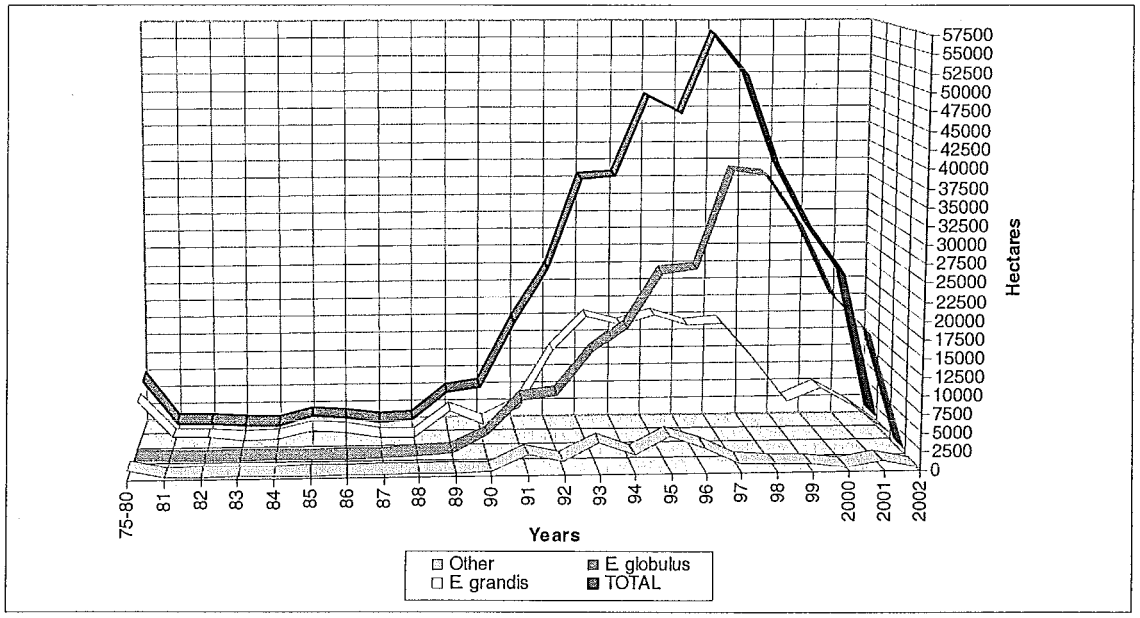

Figure 3.1 *Eucalyptus* plantation-grown resource in Uruguay: historical evolution of plantation rate by species, 1975-2002.

Source: Dirección General Forestal (2003).

Regional distribution

Eucalyptus plantations are situated throughout the country. However, proximity to ports, existing railways and highways, site conditions and the abundance of forestry priority soils have influenced decisions concerning forest establishment. The relative contribution of each of the 19 Uruguayan departments to the total *Eucalyptus* resource by species is dissimilar. Río Negro and Paysandú ("litoral" region), Rivera and Tacuarembó (North-east region) and Lavalleja (Southern region) account for more than half of the current *Eucalyptus* plantation-grown resource. Refer to Appendix 3 for more information on gross area by species and departments.

Graphs in Figure 3.2 and Figure 3.3 show the gross area of *E. grandis* and *E. globulus* by department. As can be seen, the Northern departments are the preferred ones for *E. grandis* plantations (Figure 3.2), while Lavalleja, a Southern department, is mostly preferred for *E. globulus* (Figure 3.3). The Northern provinces' feature deeper soils which benefit the growth of *E. grandis*; however, because of the higher temperatures, this location adversely affects the healthy growth of *E. globulus* species.

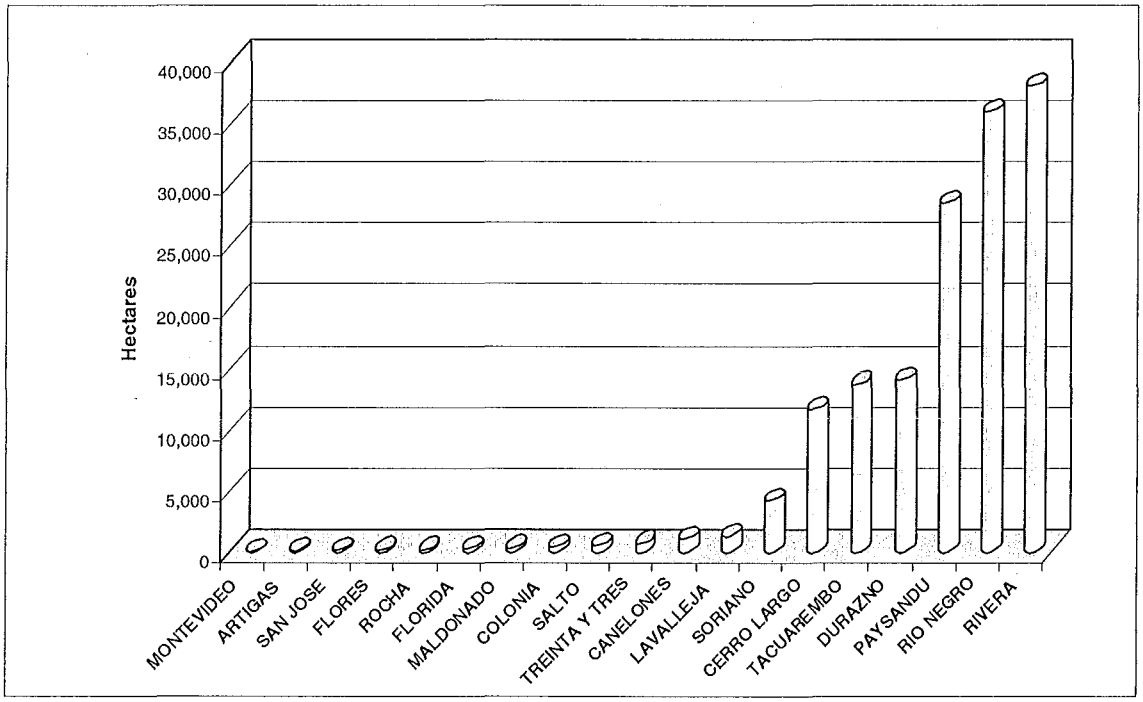

Figure 3.2 *Eucalyptus grandis*: gross area of plantation by department as at Dec. 2001.
Source: Dirección General Forestal (2003).

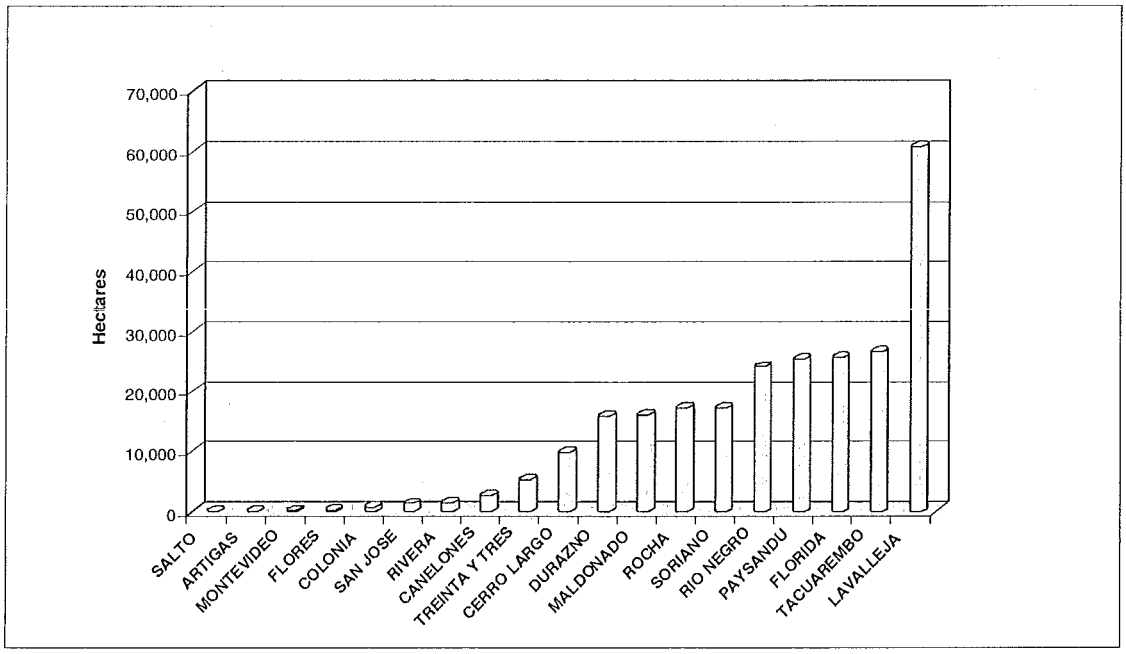

Figure 3.3 *Eucalyptus globulus*: gross area of plantation by department as at Dec. 2001.
Source: Dirección General Forestal (2003).

Industry structure

The plantation and processing of *Eucalyptus* in Uruguay is based on private, national and international enterprises. Twelve companies own half of the total eucalypt plantation estate. Domestic companies can be aggregated in four categories: private family groups (COFUSA-TILE-URUFOR owned by the Otegui family), pension funds (e.g. CJPPU, CJPN), investment funds (e.g. Paso Alto) and associations of private owners (e.g. AFCL, FORESUR) (personal communication with companies, 2004). The area of *Eucalyptus* plantations owned by the Government is small and difficult to quantify. State forests comprises about 4 740 hectares and includes mixed forests of eucalypts, pines, other exotic species and indigenous species. State forests are intended for fuelwood or recreation, minor area is believed to have a commercial purpose (e.g. BSE eucalypt plantations) (Dirección General Forestal MGAP, 2003).

However, what most characterizes the *Eucalyptus* sector is the significant participation of international companies, vertically integrated and with important capital investments in land, plantation forests and processing industries inside the country. Some of them are ENCE from Spain, Weyerhaeuser from the US, Metsä-Botnia from Finland and Chilean groups.

Silvicultural regimes

Silvicultural regimes differ according to species and intended final use. Table 3.2 presents a summary of the *Eucalyptus* regimes most commonly applied by Uruguayan companies. *E. globulus* is being managed in Uruguay exclusively to obtain logs for the pulp and paper industry. Under this premise, regimes of the order of 8 - 11 years are the common practice, being carried on up to three rotations under the coppice system, or, on the contrary, only one rotation followed by replanting (the decision depends upon the company, its sites and the availability of new cloned material). No pruning or thinning is required for the intended "log outcome" of these short rotation regimes. The minimum diameter considered for pulplogs ranges between five and eight centimetres.

Table 3.2 Outline of regimes applied to *Eucalyptus* species in Uruguay.

Species	Final product	Regime	
Eucalyptus globulus	pulplogs	single purpose	short
Eucalyptus grandis	pulplogs	single purpose	short
	sawlogs + pulplogs	multi purpose	long
	sawlogs	single purpose	long
Other *Eucalyptus*	pulplogs	single purpose	short

Note: single and multiple purpose regimes also include fuel logs as a final product (when log diameters are too small for a pulp or sawing utilization). Other *Eucalyptus* mostly includes *Eucalyptus dunnii* for pulpwood. Short regimes = 8-11 years; Long regimes 16-20 years.

For *E. grandis* three different regimes are common in Uruguay: a pulpwood regime and two sawlog regimes. The pulpwood regime is applied to 52 000 hectares[7] and does not differ from that previously discussed for *E. globulus*. However, sawn timber is clearly the objective of most of the planted area of *E. grandis* in Uruguay (about 100 000 hectares are intended for sawlog purpose). The most common sawlog regime applied is the multipurpose one, where rotation lengths are longer and wood quantity is the priority (apart from the sawlogs, pulp and fuel logs are a valuable part of the total final wood outcome). Conversely, a single purpose regime is being applied to the best forest sites. The most innovative regimes have a 16-year rotation length and numerous early pruning and

[7] The largest company that manage *E. grandis* for pulpwood purposes is FOSA with 18 000 hectares.

thinning activities that seek to maximize quality clearwood on a small number of final trees. As considered by Donnelly et al. (2003b) Uruguay is leading the world with its aggressive forest management practice for *E. grandis*.

About 65 000 hectares of *E. grandis* plantation forests are intended for sawlogs and intermediate products (multi purpose regimes) while approximately 35 000 hectares are entirely managed with a single product objective: clear-sawnwood (personal communication with companies)[8]. More market success would likely change the ratio.

Forest certification

To date, there are a significant number of certified forest companies in Uruguay. Forest certification began in early 2000 as a way to attain formal credibility for sustainable forest management practices, products and services (increasingly in demand for forest products in international trade). Forest Stewardship Council (FSC) certification has been the most popular. A list of the Uruguayan companies that are FSC-certified and their area of *Eucalyptus* is shown in Table 3.3. It is worth noting that the total forest management certification area (75 094 hectares) represents about 12% of the Uruguay forest estate (615 613 hectares). *Eucalyptus* FSC forest management certified area (49 474 hectares) also represents 12% of the total plantation area of *Eucalyptus spp.* (424 199 hectares).

[8] The management of *E. grandis* for a clear-sawnwood objective is conducted in Northern Uruguay (Rivera and Tacuarembó departments) by the companies Colonvade/Los Piques and Cofusa. Further detail on these forests will be presented in Chapter 4.

Table 3.3 Plantation forest management FSC certification in Uruguay – *Eucalyptus* certified area by company and certification body.

Company	Certification Body	Year	Certified area (ha)	*Eucalyptus* area (ha)
COFUSA	SGS	2000	25 210[9]	19 650
COFOSA	SGS	2000	31 754[10]	29 351
FYMNSA	R.A.	2002	13 059	82
Industrias Forestales Arazatí S.A.	R.A.	2001	5 040	360
Grupo Forestal San Gregorio	SGS	2003	32	32
TOTAL AREA			75 094	49 474

Source: adapted from FSC, SGS and Rainforest Alliance certification reports and posterior surveillances available on line: http://www.fscoax.org (FSC); http://www.sgsqualifor.com (SGS); http://www.sgs.com.uy (SGS in Uruguay); http://www.brandsystems.net/Smartwood (Smart Wood-Rainforest Alliance).

References:

COFUSA– Compañía Forestal Uruguaya S.A.

COFOSA– Compañía Forestal Oriental S.A., also known as Forestal Oriental or FOSA (owned by Finnish forest industry groups Oy Metsä-Botnia Ab (60% share), UPM-Kymmene Corporation (38.38%) and Finnfund (1.62%).

FYMNSA– Forestadora y Maderera del Norte S.A. (national forest company with pine forests)

SGS– Societé Générale de Surveillance, Qualifor Programme

R.A. – Rainforest Alliance, Smart Wood Programme

Note: Certified areas include plantation area, native forests, roads, etc.

Apart from forest management certification, TILE and URUFOR (both owned by the same group of COFUSA) have an FSC forest products chain of custody certification. Moreover, Colonvade (Weyerhaeuser) obtained ISO 14 001[11], while EUFORES (from ENCE Spain) obtained ISO 14 001 and OHSAS 18001[12]. Colonvade/Los Piques has 17 800 hectares of *Eucalyptus* and EUFORES has 36 900 hectares. Other forestry companies intend to apply

[9] Lately, by July 2002, COFUSA expanded its certified forest area to 48 295 ha; however no information on the additional area of certified *Eucalyptus* was given. It is presumed that most of the incremental area corresponds to *Eucalyptus* as it is the main genus planted by COFUSA.

[10] Less than 1 000 ha were added by December 2002.

[11] ISO 14001: Environmental Management Systems.

[12] OHSAS 18001: International occupational health and safety management system.

for, or are in the process of obtaining FSC forest management and chain of custody certification (EUFORES is included in the first category).

Hence, a 25% of the *Eucalyptus* forest sector has obtained certification from reliable, widely known certification systems: FSC and ISO. Certification has not only been obtained for individual companies, there is also group certification (Forest Group San Gregorio).

Roundwood production: harvest volumes

At a country level roundwood harvest for all plantation-grown eucalypt species was reported as 3 million cubic metres for the year 2002. This is 15% above the 2001 harvest level. Figure 3.4 shows that almost half of total roundwood production corresponds to industrial roundwood (i.e. pulplogs, sawlog-veneer logs and others). Although still below wood fuel, the harvest of Industrial roundwood has shown a slightly increase (from 47% share in total roundwood by 2000 to 49% by 2002). By far, the major component of industrial roundwood is pulplogs.

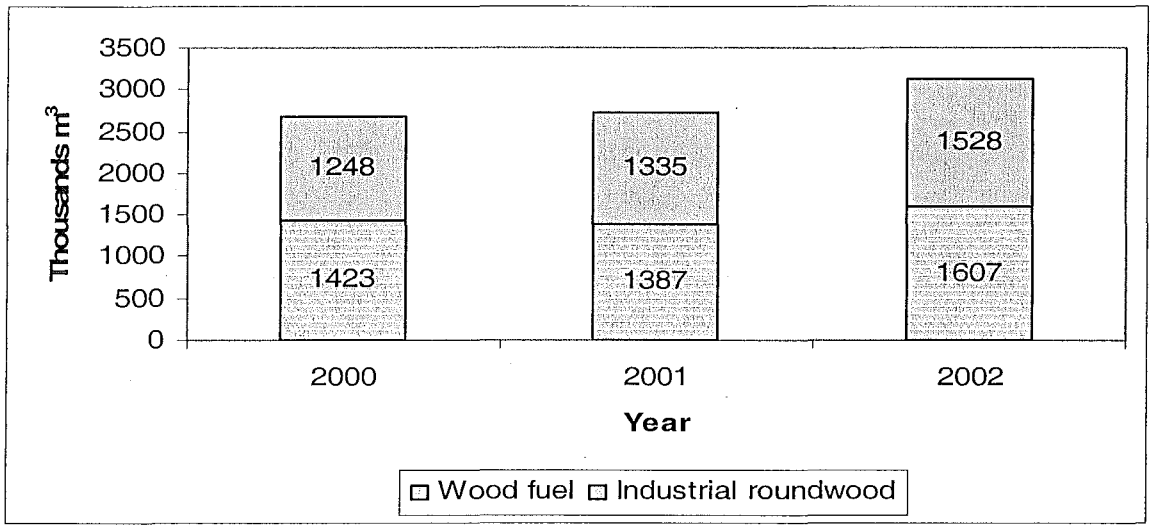

Figure 3.4 *Eucalyptus spp.*: roundwood harvest rate for the period 2000-2002.

Source: Based on Dirección General Forestal (2003) statistical data on harvest rates.

Processing industries

The processing stage for *Eucalyptus* roundwood is still in its infancy in Uruguay. However, a great dynamism of the industry has occurred in Uruguay over the last years with significant plans for future industry establishment in the country. At the moment, the processing industry for *Eucalyptus* in Uruguay can be divided into three groups:

a. pulp and paper industry
b. primary processing industry
c. secondary processing or remanufacturing industry

Fabrica Nacional de Papel (FANAPEL) owns eucalypt forests and produces pulp, writing and printing paper for the domestic and export markets. Papelera de Mercedes (PAMER) and IPUSA produce paper and cardboard box mainly from recovered material, with no eucalypt pulp production.

In addition, during 2003 two international companies that have plantation-grown eucalypts in the "Litoral" region made public its future investment in bleached Elemental Chlorine Free (ECF) eucalypt pulp. Botnia mill, the largest mill project, will mainly use FOSA's *E. grandis* and *E. dunnii* resource and plans to start its pulp production by 2007-2008. ENCE mill in Uruguay will count on Eufores[13] eucalypt log supply (principally *E. globulus* and *E. dunnii*) and plans to be ready by 2006-2007. *Eucalyptus* annual pulp production is expected to be 1.0 million ton for Botnia mill and 400 000 ton for Eufores mill. Botnia mill will consume 3.5 million cubic metres of eucalypt wood per year. ENCE mill will consume 1.5 million cubic metres per year. Botnia and ENCE are world leading producers of pulp. Botnia has five pulp mills in Finland. ENCE has three pulp mills in Spain.

Primary and secondary processing of *Eucalyptus* includes a number of small and medium scale sawmills. Except for a couple of them, most sawmills produce lumber for the domestic market and for pallet production oriented to Northern Hemisphere export markets.

[13] Eufores is one of the largest Uruguayan exporters of eucalypt pulplogs; the first exporter for 2002 with 600 000 cubic metres (Eufores, company information).

Major sawmills for the processing of *E. grandis* are URUFOR and MASERLIT. In Rivera URUFOR, COFUSA's associate sawmilling company, is reported to produce annually 35 000 m^3 of *E. grandis* sawn lumber both in green and air-dried condition. URUFOR remanufacturing facilities produce structural lumber "vigas", edge glue panels, "machimbre", solidwood flooring and moulding (URUFOR S.A., 2004). In Río Negro Maderas Aserradas del Litoral (MASERLIT), ex-Southern Cross sawmill plus a second chipper-canter and further remanufacturing and drying investment, from ENCE group in Uruguay has a reported production capacity of 28 000 m^3 of pre-dried sawn lumber initially for packaging and pallets to Europe. Latterly quality lumber for flooring and furniture was produced. Further investments in drying, remanufacturing and gluing allowed the production of "core" eucalypt flooring (Eufores company information, 2003).

Other relevant companies for the processing of eucalypts include Caja Bancaria and Industrias Forestales Arazati. The latter company has a small production of lumber and solidwood flooring from red eucalypt species. Other small mills are cutting and remanufacturing *Eucalyptus* lumber but with a lesser capacity, with no owned forests and basically oriented to the domestic market (e.g. Qualitas, Landarte, Scavone and Raíces) (Annunziatto, pers. com., 2003).

Drying capacity is still a limiting factor for the Uruguayan *E. grandis* industry. URUFOR has five Hildebrandt kilns and a total kiln capacity of 450 m^3. Caja Bancaria has four kilns and a total effective capacity of 160 m^3 (40 m^3 each). Delamonte (not operating) has two kilns of 40 m^3 each and Pocono one kiln of 25 m^3 (Annunziatto, pers. com., 2003).

New investments in the processing area for value-added *Eucalyptus* products have been announced the last quarter of 2003. These are enumerated below:

- Production of *Eucalyptus* floating parquet by Maderas de M'Bopicua. Mill to be installed by Eufores close to its private logistic area M'Bopicuá, Río Negro. Projected production capacity of 1 million m^2/ year.
- Remanufacturing industry for solidwood *E. grandis* and loblolly pine already in progress: sawmilling, rotary peeling and composite panel investment by Weyerhaeuser in Uruguay. Five mills are anticipated for Rivera, Tacuarembó and

Paysandú in Northern and "litoral" Uruguay. Mill construction planned for 2004 to 2012 time period.

- Possibly manufacture (not yet announced) of solidwood *Eucalyptus* products by Italian investors in Paysandú (likely furniture production).

Other recent and future investments relevant for the *Eucalyptus* export oriented industry are:

- The first two eucalypt chip mills are operating in Peñarol (Montevideo) and Fray Bentos (Río Negro), each mill with 500 000 m^3 of annual capacity and are owned by Eufores.
- Future improvement of the deep-water port of La Paloma (Rocha- East Uruguay) with private log terminal and chip mill construction by Consorcio del Sur (Grupo Forestal together with FORESUR).

***Eucalyptus* exports: products, markets and prices**

Historically, Uruguay has exported low-value processed *Eucalyptus* solidwood products: logs and sawnwood. Both are commodity products. In value terms, *Eucalyptus* logs represented 81% of the country's solidwood exports while *Eucalyptus* sawnwood had a 7% share for the December 2002 exports. The remaining 11% corresponded to pine sawnwood.

Exports of *E. grandis* and *E. globulus* logs reached a historical high level in 2002; nearly 1 million m^3 (under bark volume) valued at US$ 42 million. The average export price was 39 US$/$m^3$ FOB. This was the lowest log price since 1993. Log destinations are mainly European countries that import pulplogs for their pulp and paper industry. Spain and Norway were the main export destinations accounting for 77% of total value log exports, followed by Finland, Morocco and Italy which represented 22% of total value log exports.

Exports of *Eucalyptus* sawn timber for the year ending December 2002 were 29 669 m^3 $_{UB}$, valued at US$ 3,751,657. The average export price was 126 US$/$m^3$. The main country of destination was Italy (41% of export value), followed by Japan (20% of export value) and Indonesia (Rimoldi, 2003). Italy and the US are important destinations for pallets and low volumes of "cuadrotis" (lateral parts for wooden boxes exported in green condition).

Figure 3.5 shows historical trends for *Eucalyptus* exports for different species and products. Pulplog exports show that the species share has changed over the last few years. While export volumes of *E. globulus* and *E. grandis* were relatively similar until the late 1990s, *E. grandis* increased its share over *E. globulus* pulplogs in 2002, reversing the 2000 results. Comparing total log exports (both species) in 1996 and 2002 volumes have more than doubled. The average export volume of sawn *E. grandis* timber for the period is 27 000 m^3/ year, far below log exports.

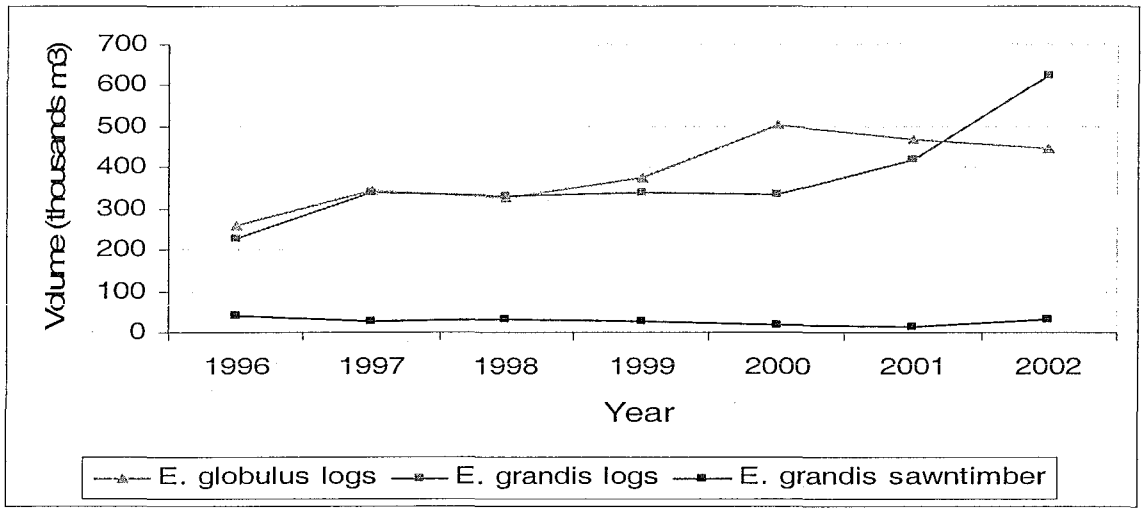

Figure 3.5 Export volumes for *Eucalyptus* products: pulplogs and sawn timber.
Source: Based on data from Rimoldi (2003).

Figure 3.6 presents average export prices for *E. grandis* and *E. globulus* pulplogs. Export prices are higher for *E. globulus*, at least 60% over *E. grandis* price. Pulp and paper prices in the international markets have cyclical fluctuations, which are reflected in pulplog prices.

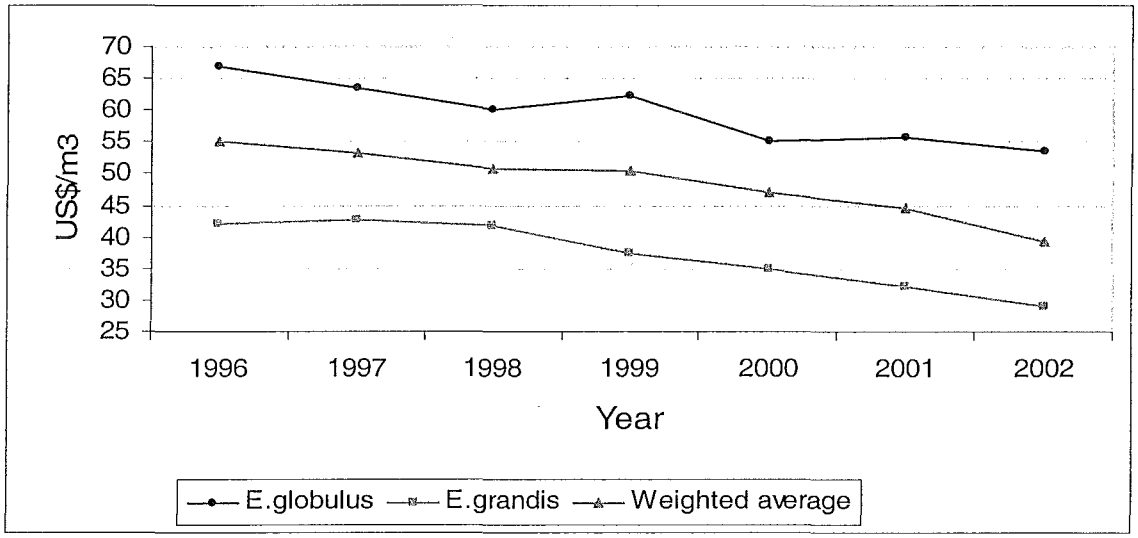

Figure 3.6 Export prices for *Eucalyptus* logs by species over time (F.O.B. prices).
Source: Based on data from Rimoldi (2003).

Figure 3.7 gives export prices for *Eucalyptus grandis* sawn timber. Maximum and minimum prices widely differ and also change annually. Average FOB prices for the latest years have ranged from 120 to 160 US$/m^3.

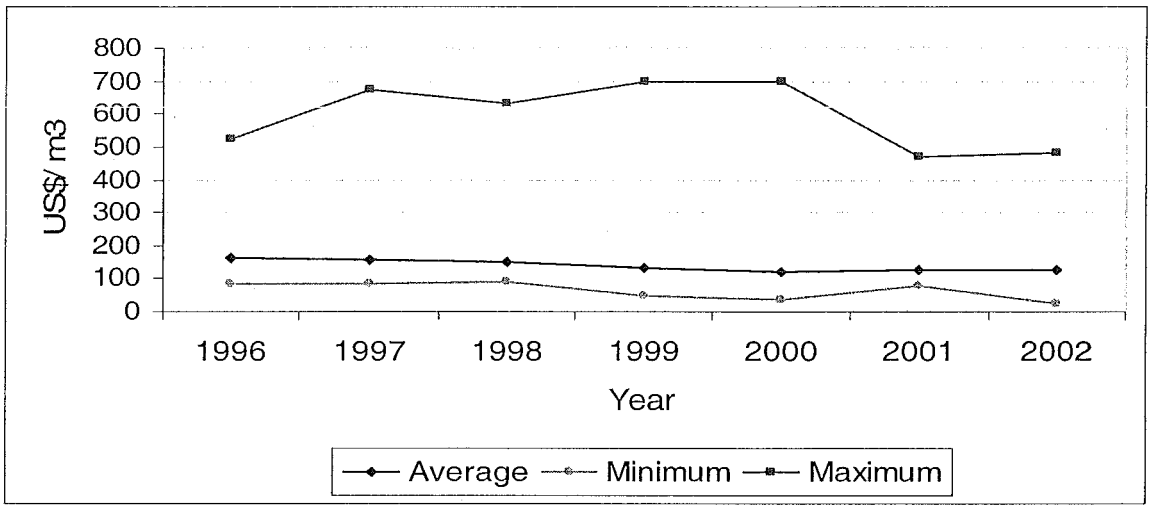

Figure 3.7 Export prices for *E. grandis* sawn timber over time (F.O.B. prices).
Source: Based on data from Rimoldi (2003).

3.3 Summary

A forestry sector has been established in Uruguay over the last 15 years. This was clearly the result to government incentives for the plantation of fast-growing exotic species. *Eucalyptus* stands were (and still are) largely tended for fuel and pulplog purposes.

Uruguayan forest exports of low-value products, "commodities" in the international markets, have shown fluctuating prices. Export prices for *Eucalyptus* logs and sawn timber are falling. They are highly vulnerable to global trade cycles as well. This has motivated some companies to pioneer the management of *E. grandis*, aiming for quality raw material for the processing of value-added *Eucalyptus* products. For the processing of the wood on stream industrial development with modern value extraction including processing, drying and remanufacturing will be required. Marketing investment will also be needed.

CHAPTER 4 VOLUME SUPPLY FROM PRUNED *EUCALYPTUS GRANDIS* IN NORTHERN URUGUAY

Currently there is limited quality sawlog supply of well managed plantations of *E. grandis* in Uruguay. Lumber produced is either from logs of older trees that have received no pruning or of young pruned thinnings. Clear-fell harvest is due to come. Volumes were projected for intensively managed *E. grandis* plantations in Rivera department with the objective to quantify future wood supply from the region. Merchantable volumes by log type were calculated for a selected silvicultural regime and then applied to the Rivera forest estate. Forecast results are intended to be an indication of the volume to be available for different product applications, including clearwood volume from pruned sawlogs suitable for the processing of solidwood products. The first harvests are expected to start by 2009.

4.1 Solidwood *E. grandis* forests

Plantation area and main companies

The major forest companies that manage *E. grandis* plantations for solidwood purposes in Uruguay are COFUSA and Weyerhaeuser (locally known as Colonvade and Los Piques). Reported plantation area for the species is 19, 650 hectares for COFUSA, 8, 863 hectares for Colonvade and 8, 950 hectares for Los Piques[14] (Altsuler, 2003; SGS Qualifor, 2000). These forests are located in Northern Uruguay, largely in the Rivera department.

As reported by the government forest agency, the cumulative plantation area for *E. grandis* in Rivera for the period 1975 - 2002 was 39, 500 hectares (Telechea, pers. com., 2004). About 31, 600 hectares were established over the period 1993-2002 (Dirección General Forestal MGAP, 2003). In the near future these plantations will lead the country supply for clearwood *Eucalyptus.* Manufacturing facilities for the processing of the wood on stream into value-added wood products (SPWP) will also be located in the proximity of the forests. The region is anticipated to be the plantation and industry centre for solidwood eucalypts.

[14] Los Piques 8, 950 hectares of *E. grandis* plantations in Rivera was purchased by Weyerhaeuser in June 2001 from West Fraser Timber Company and Associates (Altsuler, 2003).

Silvicultural management

E. grandis plantations in Rivera are managed under diverse silvicultural regimes. Regimes vary by company and plantation growing site. Also, companies have changed their management regimes over time with more intensive regimes being implemented over the last decade. This has resulted in stands of different ages being managed with different regimes (e.g. some young stands have already received pruning while older stands planted at early 1990s have not). The most recent features that characterize *E. grandis* plantations when managed under solidwood regimes are summarized as follows:

- Objective: Maximize high quality wood per tree and unit area.
- "High quality wood" recognized as wood with minimal defects, homogeneous and concentrated in high dimension pieces (clearwood in New Zealand).
- Objective is attained through intensive pruning and thinning schedules that concentrate high quality wood in few trees per hectare (low stocking).
- Pruning interventions: pruning of green branches to limit knot frequency and residual effect (kino veins); starting at early ages (as early as 1.5 or 2.0-year-old or when trees are 6.0 metres height); several lifts increasing pruning height up to 8.0-10.0 metres height. COFUSA has reported for its forests that pruning up to 10 metres tree height will likely result in logs of knotty core of 16.0 cm for 5.0 metre butt logs, and knotty core of 19.0 cm for 5.0 m second logs (SGS Qualifor, 2000).
- Thinning interventions: two to three thinnings; aimed to improve tree growth and timber quality by reducing stocking, competition and risk of fire; first thinning to waste at early forest age (generally at age 1.5 - 2.0) lowers initial stocking up to 50%; last thinning generally close to half of rotation results in a further lessening of stocking, the best 150 – 200 trees per hectare are kept until final harvest.
- Intended rotation age: 16 – 17 years.

Table 4.1 shows selected solidwood regimes applied to *E. grandis* plantations in Rivera. Most plantations are currently being managed under these or slightly modified regimes. Regime 1 and 3 are more conservative than regime 2 where a third thinning intervention takes place at age 6 (i.e. stands are further opened up between thinning ages 2 and 9). Regime 2 is the latest variation implemented since 2003 and concentrates the final harvest volume in 150 trees per hectare.

Table 4.1 *E. grandis*: Examples of sawlog single-objective regimes for Rivera, Northern Uruguay.

Regime	Tending	Age (years)	Prune Height (m)	Pruned Trees (stems/ha)	Stocking (stems/ha)		Thinn. Type
					Pre-thin	Post-thin	
1	Thin, 1st	1.5-2.0	-	-	1 000	400	W
	Prune, 1st	1.5-2.0	2.3	400	-	-	-
	Prune, 2nd	2.0-2.5	4.5	400	-	-	-
	Prune, 3rd	2.5-3.0	6.5	400	-	-	-
	Prune, 4th	3.0-4.0	8.5	400	-	-	-
	Prune, 5th	4.5-5.0	10.5	200	-	-	-
	Thin, 2nd	9	-	-	400	200	P
	Final harvest	16	-	-	200	0	P
2	Thin, 1st	2	-	-	900	400	W
	Prune	2-6	10.5	-	-	-	-
	Thin, 2nd	6	-	-	400	300	P
	Thin, 3rd	9	-	-	300	150	P
	Final harvest	16	-	-	150	0	P
3	Thin, 1st	2	-	-	1 000	500-600	W
	Prune, 1st	2	3	500	-	-	-
	Prune, 2nd	3	6	500	-	-	-
	Prune 3rd	4	8.7	200	-	-	-
	Thin, 2nd	9	-	-	500-600	200	P
	Final harvest	16	-	-	200	0	P

Data collected from several sources of information.

Thinning type: P = Production W = Waste

4.2 Volume forecast

4.2.1 Stand level analysis

Methodology- A stand level forecast was conducted for a single hectare using INIA (Instituto Nacional de Investigación Agropecuaria or Uruguayan National Institute of Agriculture Research) *Decision Support System for E. grandis plantations (DSS grandis)* developed by Dr. Ricardo Methol. Growth projections, thinning and log cutting simulations included in Module "Stand 1" were utilized. Silvicultural regime 3 (presented in Table 4.1 above) was selected due to a good representation of the regimes so far implemented in Rivera. Regime 3 is a mid-point between regimes 1 and 2, and so forecast volumes are expected to be conservative.

To perform stand volume forecast with *DSS grandis* the following data was input into the system:

- Rivera CIDE Zone = 7.
- Site Index = 31 (as the average mean top height at age 10 for *E. grandis* growing in Zone 7). Site indices estimated for Zone 7 range from a minimum of 22.5 to a maximum of 35.3 with a mean value of 30.7.
- Silvicultural data (stocking, thinning and pruning schedule presented in Regime 3 included in Table 4.1).
- Stocking after the first thinning operation was 500 stems per hectare.
- Five log types were prescribed (presented in Table 4.2).

Table 4.2 Log type specifications employed for log cutting simulations.

Log Type	Minimum under bark diameter (cm)	Log length (m)	Pruned (Yes/No)
Sawlog SP1	35.0	4.0	Y
Sawlog SU1	35.0	4.0	N
Sawlog SP2	25.0	4.0	Y
Sawlog SU2	25.0	4.0	N
Pulplogs	8.0	4.4	N

Results- Gross volume predictions on standing trees (total volume and merchantable volumes by log type) were obtained after running the model for the selected regime and log type specifications. Results from log cutting simulations showed that until age 7 all volume produced corresponds to logs of less than 25 cm of diameter (small logs). Given the specified log type schedule (Table 4.2), this small-diameter volume is assigned to the pulpwood category. Note, that small logs can have other utilizations. Logs of 16 cm minimum diameter under bark are used for pallet production, but are difficult to process for higher-valued applications under current technology.

Production thinning at age 9 yields a volume of 123 cubic metres per hectare of which 112 m^3 corresponds to pulplogs and the rest is waste volume. Small pruned sawlogs (SP2) began to be obtain at age 8 while large pruned sawlogs (SP1) start to occur at age 12 (Figure 4.1). All volumes correspond to under bark estimations over a fixed stump height of 0.3 metres.

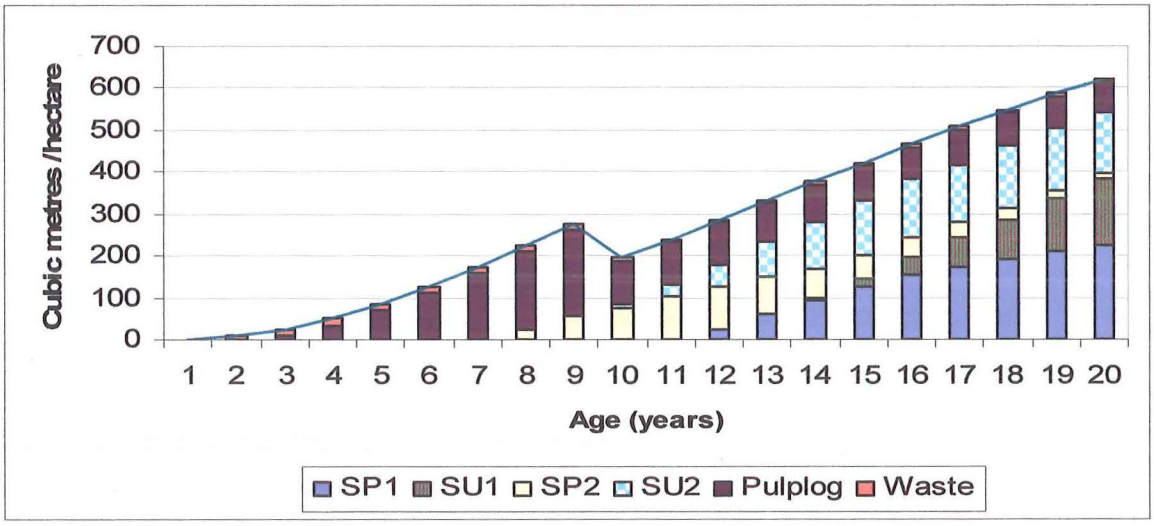

Figure 4.1 *E. grandis* in Rivera: Growing stock volume per hectare by log grade and by final harvest age (for a selected regime).

Notes: Log grades - Sawlog large pruned = SP1; Sawlog large unpruned = SU1; Sawlog small pruned = SP2; Sawlog small unpruned = SU2. Refer to Table 2 for specified log diameters and lengths.

A total standing volume of 466 m^3 per hectare was projected for final harvest at age 16. Regarding volumes by log type, the pruned component (large plus small pruned sawlogs) represent 42% of the total merchantable volume per hectare (153 m^3 for SP1 and 43 m^3 for SP2 over a total volume of 466 m^3).

As shown in Figure 4.2, for harvest ages over 16 years volume of pruned sawlog increases slightly. However, total volume increase over age 16 is mainly due to unpruned volume (117 m^3 of unpruned log volume produced for the period 16-20 years versus 45 m^3 of pruned sawlogs). Harvesting above age 16-17 may result in lower financial return.

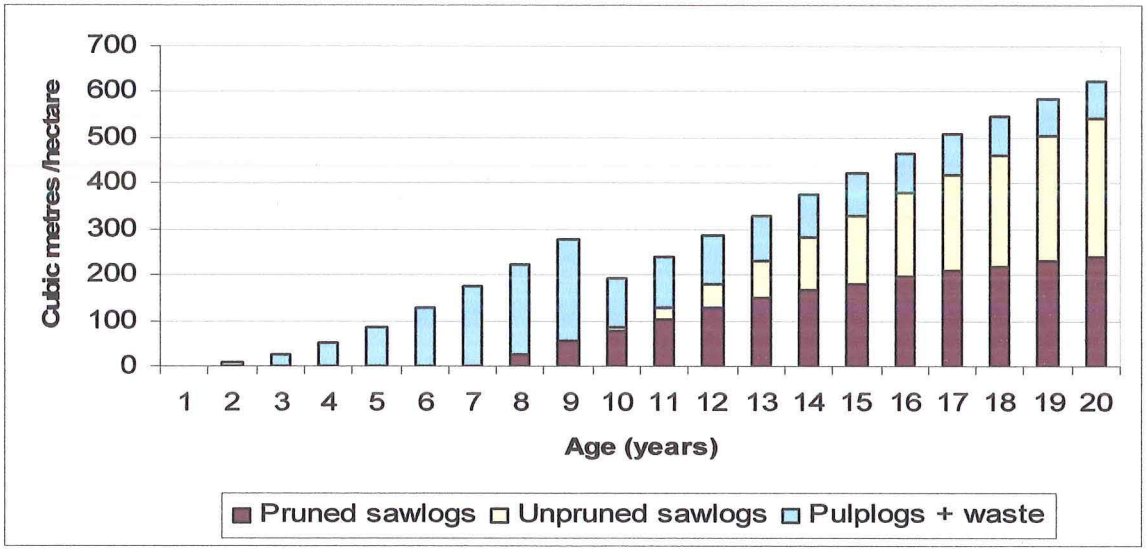

Figure 4.2 *E. grandis* in Rivera: Growing stock volume per hectare by log grade: pruned sawlogs, unpruned sawlogs, pulp logs and waste (for a selected regime).

Notes: Pruned sawlogs = SP1 + SP2; unpruned sawlogs = SU1 + SU2.

Assuming an intended rotation age of 16 years volume projections per hectare are of 465.5 m^3 to be obtained in 184 trees of 2.5 m^3, each of them pruned up to 8.7 metres height[15].

[15] The number of trees obtained at harvest age 16 is lower than the 200 trees per hectare defined as residual trees in the thinning schedule. 184 trees reach final rotation age which is due to natural mortality assumed in growth modelling.

4.2.2 Estate level analysis

Methodology- Based on the volumes by log type obtained for the selected regime (stand level analysis), a forecasting exercise was conducted at an estate level for 31, 560 hectares of *E. grandis* plantations established in Rivera during the period 1993 – 2002. For volume forecast purposes these forests are assumed to be managed with solidwood intentions.

The period 1993 – 2002 was defined for the following reasons. The starting point 1993 was set because companies in Rivera started the shift to solidwood regimes approximately in the mid 1990s (Fossati, pers. com., 2004). The inclusion of plantations established as at 2002 was due to effective planted area provided by the forest government agency in Uruguay (published data for plantation projects accepted under the Forestry Law subsidies was last updated in December 2002).

The age class distribution assumed for *E. grandis* plantations in Rivera was elaborated based on the effective annual plantation area for the period 1993 – 2002. A spreadsheet analysis tool was developed for forecasting thinning and harvest volumes over time. No new planting area was included after year 2002. Consequently, volume projections were conducted until year 2018 (i.e. plantation area established in 2002 plus 16 years of rotation age). Also, the projections do not include replanting of harvested areas.

Results- Volume from thinning operations will be obtained until 2008. The volume resulting from the final harvest is anticipated to start in 2009 with 1.5 million cubic metres. Merchantable volumes from thinning and final harvest operations are expected to fluctuate over time due to the lack of normality of the forest estate (Figure 4.3).

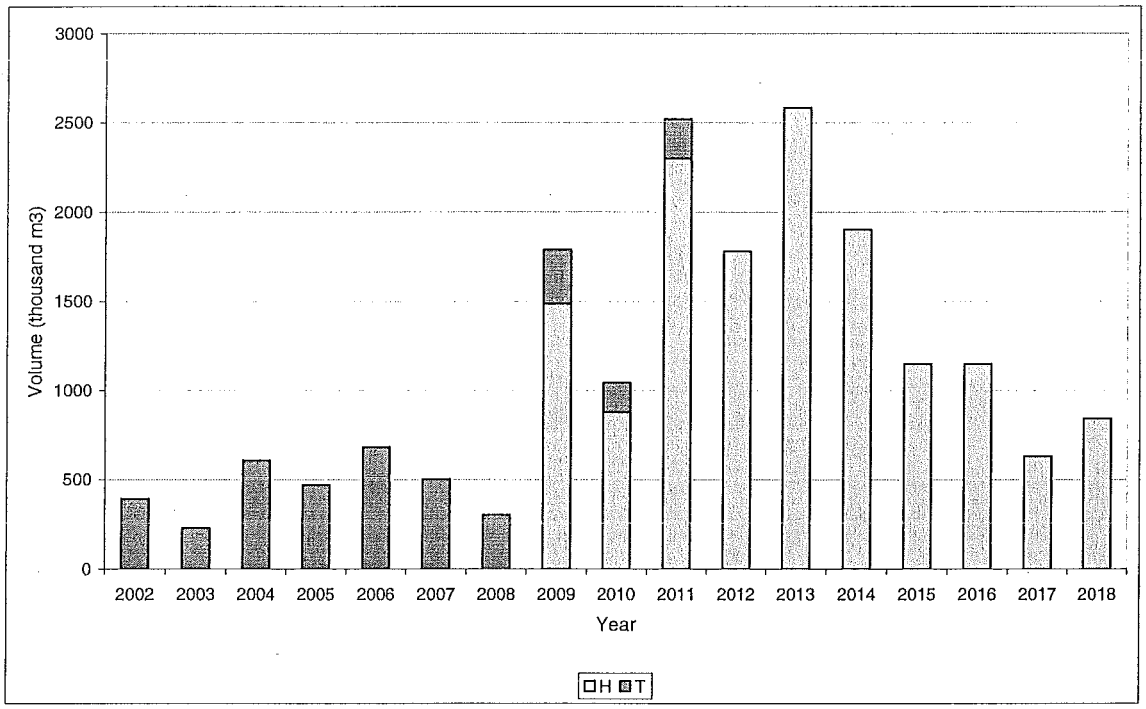

Figure 4.3 *E. grandis* volume forecast for Rivera: harvest and thinning volumes over time for the period 2002-2018.

Notes: H = Harvest T = Thinning

With a no replanting scenario, no thinning volume occurs after 2011. As plantation areas established after year 2002 are not included in the forecast exercise total volumes after year 2011 will be, in reality, higher reflecting thinning volumes from planted areas established after 2002. For instance, with the assumed thinning intervention at forest age nine, plantations established in 2003 and 2004 will yield production thinning volume in 2012 and 2013.

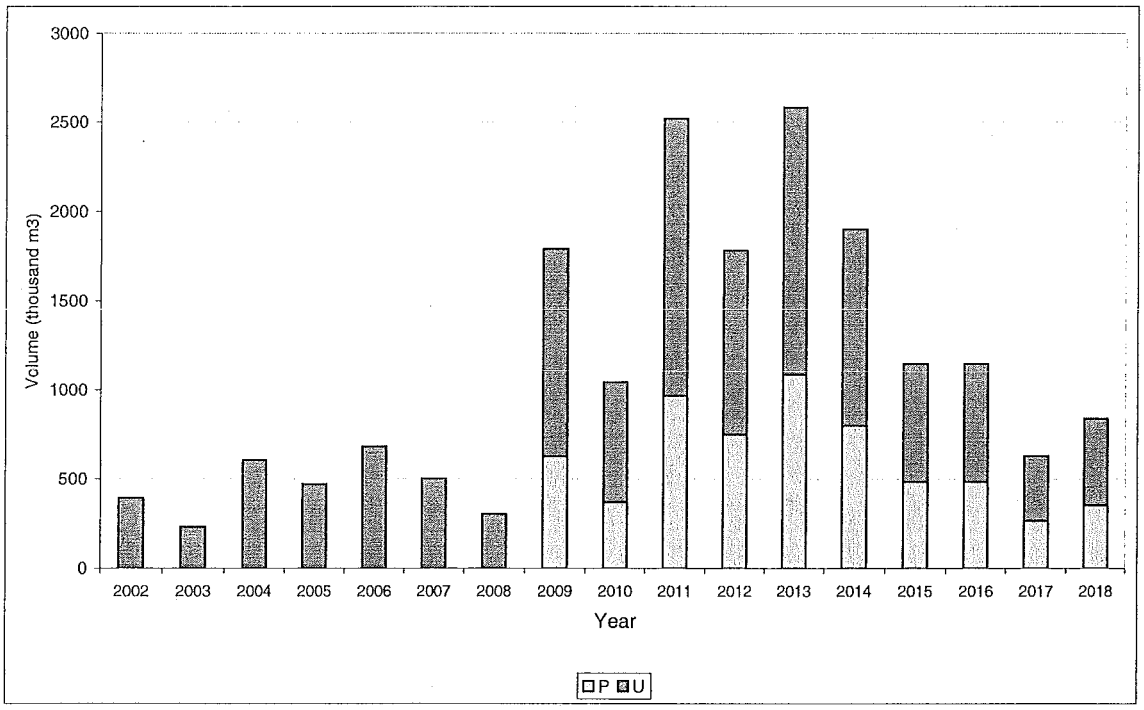

Figure 4.4 *E. grandis* volume forecast for Rivera: pruned and unpruned volumes over time for the period 2002-2018.

Notes: P = Pruned U = Unpruned

Once volume from final harvest starts to occur in 2009 it is anticipated that a 42% of the total volume will be pruned, knot-free volume. For the period 2009-2018 results show an average annual pruned volume of 0.6 million m^3/year to be available for harvest (Figure 4.4).

Limitations of the volume forecast-

Volume forecast in this research are intended as a guideline only. The methodology followed for wood volume estimations includes several assumptions. The forecast analyses present the following limitations:

a. Volume forecast was limited to the Rivera department. While other forests of *E. grandis* exist outside the boundaries of Rivera, Rivera is the region that has the highest area for the species and leads in solidwood management. Other companies are reported to manage their *E. grandis* resource seeking a clearwood output, yet with not such intensive regimes.

b. Forecast is based on the existing *E. grandis* area established within the period 1993-2002. Forest area established before 1993 (7 950 hectares) was not considered as was assumed to be managed for pulp and fuel. Records for plantation areas for 2003 and 2004 were not available.

c. The use of one silvicultural regime generalized to the whole resource. It was assumed that the *E. grandis* forest area established in Rivera since 1993 is being managed with the selected silvicultural regime. The selected regime is considered to be conservative when compared to the highly intensive regimes that have lately been implemented by COFUSA. More intensive regimes (i.e. more thinning interventions and/or higher pruning height) are expected to yield higher volume from pruned sawlog classes.

d. The shift to clearwood regimes was assumed to start in 1995. However, plantation areas established in 1993-94 were included in the analysis as they were young enough to be tended with pruning and thinning practices. Because clearwood regimes were slowly implemented in newly planted areas, with subsequent on-going testing and adjustments until these days, it is difficult to establish an accurate area for tended plantations on a yearly base.

e. Volume projections were based on a 16 year rotation age reflecting companies harvest age intentions. However, the fact that forests could be harvested at an earlier or later age is acknowledged. Companies tend to smooth its volume supply over time. Depending on companies commitments to supply logs to processing industries (matching logs supply and demand) and proximity of stands at end of rotation age (meant to ease transport costs) harvest operations can include stands that are close to the intended rotation age as well as stands that may have exceeded it (e.g. harvest of 15 to 17-year-old stands).

f. No new planted area or replanting options were considered. As a result, volume projections end at year 2019. The two main companies that own *E. grandis* plantations in Rivera have almost completed their planting programmes. Once final harvest occurs replanting areas will likely include more intensively managed *E. grandis* forests. Also, some harvested pine areas are intended to be replanted with *E. grandis* (Schmidt-Liermann, pers. com., 2004).

4.3 Conclusions

The future supply of clearwood *E. grandis* in Northern Uruguay looks positive. A large volume of clearwood will be available from managed *E. grandis* plantations in Rivera. The first harvests from single-management stands are expected to start by 2009. An average annual pruned volume of 0.6 million m^3/year will be available for harvest over the period 2009-2018.

Volume supply will initially be uneven, reflecting the also uneven age-class distribution of the forests. Forest companies with industry and export volume commitments will have forest management programmes towards yield regulation. It is then expected that the forests age-class distribution will tend to a "more even" condition and volume supply will also be smoother.

CHAPTER 5 WOOD PROPERTIES OF *EUCALYPTUS GRANDIS* IN URUGUAY

It is necessary to know the wood properties of Uruguayan *E. grandis* in order to assess its suitability for end products. Properties that relate to wood hardness, strength and stiffness are relevant for the production of appearance-grade quality lumber products. Physical wood appearance, colour, durability and workability are also important. The wide tree-to-tree variation evident in wood properties may be exploited in plantation breeding programmes to improve consistent product quality and recovery.

5.1 Introduction

The Forest Products Sector of the Laboratorio Tecnológico del Uruguay (LATU) has undertaken projects that evaluate Uruguayan plantation timbers. Particularly for *E. grandis*, studies conducted under the LATU-JICA project and the Technical Group of Sawn Eucalypts Timber (Grupo Técnico de Madera Aserrada de Eucalipto GT2) are of invaluable assistance for the assessment of wood quality, identification of future research areas and opportunities for genetic breeding.

To date, the research results allow characterization of the wood properties for *E. grandis* and confirm its potential for solidwood applications. Still, results of the physical and mechanical wood properties of the species presented in this section should be regarded as a partial indication of the species full potential. This is because studies conducted in Rivera (Northern Uruguay) had access to trees at an interim growth stage. Stands under assessment were 12 and 13.5-year-old while the intended rotation age for the region is 16 years. Moreover, it should be noted that the stands were reported to have one thinning intervention at age 7-8 (stocking was then lowered from 1 100 stems per hectare to 400-500) and lacked pruning. Hence, for more intensively managed stands and older ages it is reasonable to anticipate an improvement on wood properties[16] and an improved lumber quality.

[16] Density tends to increase with cambium age and so density-related properties. In addition, the presence of knots has a negative impact on the timber's strength (indicated by the Modulus of Rupture or MoR property). As MoR increases for clearwood it is expected that pruned stands will show higher values for MoR.

5.2 Basic wood properties

Colour

Plantation-grown *E. grandis* is a light to medium coloured hardwood that features a bright pale-pink colour in young trees and a slightly darker colour in older trees. As in other species, sapwood, heartwood and pith differ in colour. Also, heartwood colour variation within trees of the same stand and within individual trees has been shown to be wide (Böthig, 2001). The wood is photo sensitive and darkens to a blonde honey colour on exposure to sunlight.

Appearance

The wood generally has a fine to medium even texture and straight grain. Interlocked grain may be found in radial, semi-radial and tangential faces. If present, interlocked grain gives an interesting "ribbon figure" to the wood (Figure 5.1). This resembles other figured woods (e.g. mahogany, mahogany-like woods, sapelli) (Doldán, 2001).

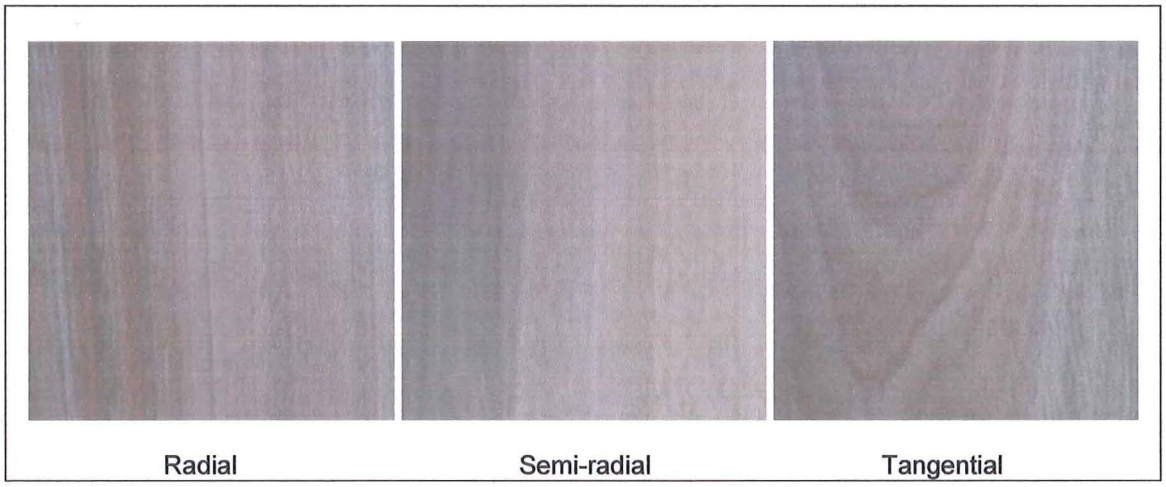

Figure 5.1 Figure derived from the presence of interlocked grain in radial, semi-radial and tangential sawn boards of *E. grandis*.
Source: Doldán (2001).

Density

Average basic density for *E. grandis* in Rivera is at the level of 430 kg/m^3. Density for dry wood at 12% moisture content (MC) was found to be 460 kg/m^3. Note these values refer to young stands and plantation-grown timbers in the Department of Rivera[17].

The report *Propiedades Mecánicas de Eucalyptus grandis H. del Norte de Uruguay* (2004) presents average values for basic density and logs moisture content of 432 kg/m^3 and 97.5% respectively. Both variables were reported to vary considerably (Table 5.1).

Table 5.1 Moisture content and basic density for *E. grandis* in Rivera.

	Moisture content (%)	Basic Density (kg/m^3)
Mean	**97.5**	**432**
Maximum	169.8	586
Minimum	33.8	344
Std. Deviation	24.3	38
CV (%)	25.0	8.9
Sampling size: 215 specimens obtained from 30 12-year-old trees		

Source: Grupo Técnico de Madera Aserrada de Eucalipto GT2 (2004).

Regarding wood basic density the study identified two levels of variation for this property:

- ⇨ variation among trees of the same stand (tree-to-tree level);
- ⇨ variation within trees (individual-tree level). Findings show that basic density increased with log height class (the assessment included three log classes per tree: 4-metres butt log; 2nd log from height 4 to 8 m; 3rd log 8 -12 m). In the radial direction density showed a pith to bark increase (increased in outward direction). Mature wood revealed a higher density than juvenile wood.

[17] For Rio Negro (Western Uruguay), Doldán (2003) reported that for 18-year-old material basic density ranged between the values 340 and 560 kg/m^3 averaging 430 kg/m^3. Average value for juvenile wood was 410 kg/m^3 while for mature wood was 450 kg/m^3. These values are very similar to the ones obtained for Rivera plantations. Still, trees assessed in Rivera were younger and were probably grown in better sites (average Site Index for Rivera is higher than for Rio Negro).

Density for dried *E. grandis* (around 12% moisture content) was reported to be in the order of 460 kg/m^3 (Table 5.2).

Table 5.2 Density for dry *E. grandis* in Rivera (circa 12% MC).

	Rivera 12 years old (values for heartwood and sapwood)	Rivera 13.5 years old (values for heartwood only)
Sampling size (specimens)	203	860
Mean (kg/m^3)	**459**	**463**
Maximum (kg/m^3)	564	691
Minimum (kg/m^3)	378	322
St. Deviation (kg/m^3)	39	59
CV (%)	8.0	13.0

Rivera 12-year-old was sourced from Grupo Técnico de Madera Aserrada de Eucalipto GT2 (2004).
Rivera 13.5-year-old was sourced from Böthig (2001).

5.3 Mechanical properties

Results of the assessment of Modulus of Elasticity (MoE or stiffness), Modulus of Rupture (MoR or ultimate strength) and side (surface) Janka Hardness[18] reported for small, defect free specimens for Rivera are presented in Table 5.3.

Table 5.3 Mechanical properties for *E. grandis* in Rivera (11.6% MC).

Property	Value
Modulus of Elasticity (GPa)	11.77
Modulus of Rupture (MPa)	83.2
Hardness – Janka tangential (kN)	3.51
Hardness – Janka radial (kN)	3.17
Sampling size: 203 specimens for MoE and MoR; 201 specimens for hardness Stand age: 12-year-old	

Source: Grupo Técnico de Madera Aserrada de Eucalipto GT2 (2004).

[18] Janka Hardness is a test which measures the pounds of pressure it takes to drive a 0.444" diameter steel ball half its depth into wood. When comparing hardness of different species the higher the value the harder the species.

5.4 Predictive relationships among quality wood properties

Identifying correlations between basic wood properties of *E. grandis* is very useful for predicting end product characteristics. Methods for non-destructive prediction of solidwood properties on standing trees and dry boards are also valuable.

For Northern Uruguay, Böthig (2001) found that Janka hardness was highly correlated to density. A regression of hardness with density as independent variable explained 81% of the variation. The relationship is described by the linear regression model:

$$H = 138.59\ d - 33.917 \qquad r = 0.90$$

where: H = tangential Janka Hardness (MPa) d = wood Density (g/cm^3)

Assessment on 855 defect free specimens; 13.5 -year-old material

The finding of the strong relationship between wood density and hardness will allow for hardness prediction to be done through density measurements given that density is easier to measure than Janka hardness (and can be estimated from standing trees). What is more, possibilities for undertaking tree selection and breeding programmes to improve timber quality should be considered as:

- ⇨ density variation is sufficient;
- ⇨ density for *E. grandis* has widely been studied (less is known about hardness);
- ⇨ density is highly heritable in young *E. grandis;*
- ⇨ increasing wood density should increase Janka hardness.

Additionally, the Pilodyn penetrometer[19] –a simple to use and non-destructive predictor of wood properties in standing trees, green or dry boards– is thought to be an effective tool for estimating density and hardness in *E. grandis.* As reported by Böthig (2001) correlations for Pilodyn and density and Pilodyn and Janka hardness are strong (coefficient of correlation, r, above the 0.7 level). Higher correlations were found for small ranges of density and hardness variation. So far Pilodyn penetrometer has been tested on

[19] The Pilodyn penetrometer measures the penetration of a spring-loaded pin into the outerwood. Penetration is negatively correlated to hardness and density (higher penetration for less dense and hard woods).

heartwood of dry, clearwood specimens. Research is needed to find out how good predictions will be on standing trees (i.e. under bark measurements for green wood).

Other relationships between physical and mechanical properties are reported for *E. grandis* in Northern Uruguay (Grupo Técnico de Madera Aserrada de Eucalipto GT2, 2004). Mechanical properties, particularly MoR and MoE, could be predicted by density (correlations for dry, clearwood samples were strong and positive).

5.5 Technical properties

Successful processing of young plantation-grown *Eucalyptus* logs depends on appropriate drying and sawing (the same applies to other hardwoods as well). However, new processing technologies for *Eucalyptus* harvesting, sawmilling, drying techniques and remanufacturing have already occurred.

Drying properties

Timber drying defects are a major concern with young eucalypts. Because of its fast-growth, boards are liable to considerable distortion in drying. Problems include collapse (a form of shrinkage), internal checking, twisting and end-splitting (due to growth stresses). End-splitting is a defect that occurs as early as the tree is harvested. Further splitting may occur on drying and conversion. Collapse and checking, the two main drying defects, can be partially reversed by steam reconditioning. Now, a slow drying process that combines air-dry, kiln dry and kiln reconditioning of the lumber (involving steaming) helps minimize degrade.[20]

Shrinkage

Studies conducted in Uruguay for *E. grandis* sourced from Litoral and Northern plantations report volumetric shrinkage of 12.7 and 13.5 per cent, respectively (Doldán, 2003). Shrinkage reflects the change in volume (for tangential and radial surfaces) from lumber in green condition to ovendry moisture content and is expressed as a percentage of the

[20] South Africa has developed a commercial "continuous dry kiln" that reduces drying degrade (Donnelly et al., 2003b).

green condition. Volumetric shrinkage for the species of 13% is at similar level of other commercial hardwoods[21].

Sawing properties

The wood of *Eucalyptus* has inherent defects. Spiral grain, growth stresses, kino veins and knots affect the conversion and processing into higher-value products. Special sawing patterns have been developed to increase product recovery. For solidwood appearance lumber knots are a major source of degrade. The presence of knots can be, however, minimized. Timely pruning is aimed to eliminate or reduce the number of knots and restrict the size of the knotty core.

Working properties

E. grandis is a relatively easy-to-work wood. Nail and screw holding (fastening) is good. No pre-drilling is required as the timber is of medium density and hardness. It allows water and oil finishes.

5.6 Other wood properties

This section presented the most significant wood properties of *E. grandis*. However, the relative importance of each property depends on the end-use of the product. Other properties not covered in this section may be relevant for particular end-uses. For instance fire resistance of *E. grandis* is important for house construction, decking and flooring. Durability under severe weather conditions and maintenance requirements become crucial for outdoor use of the lumber (e.g. garden furniture).

[21] Some examples: 12.6% alder, 11.5% cherry, 12.7% jatoba. Teak, merbau and true mahogany are low shrinkage tropical hardwoods (about 7%). Higher levels are indeed reported for other species as Jarrah (18.7%), red oaks and white oaks (shrinkage levels for American oaks are above 14%; depending on the species can even reach a 18%) (Forest Products Laboratory (U.S.), 1999).

5.7 Comparison of properties: plantation versus natural forests

The fact that plantation-grown *E. grandis* is managed with intensive regimes that seek fast growth (through low stocking) and short rotations (trees are harvested at young ages) should be considered when comparing the species' wood properties with "naturally-grown", non-plantation, eucalypts and other hardwoods. Generally, commercial timbers used for high-value applications are old growth, temperate or tropical, hardwoods harvested in 50 – 70 years from native forests. Despite this distinction on "timber age", Table 5.4 presents the wood properties of plantation-grown and native-grown *E. grandis*.

As shown in Table 5.4 *E. grandis* from natural forests has higher values for physical and mechanical properties. Plantation-grown *E. grandis* shows lower values for these properties. When values for Uruguayan and Argentinean plantations are compared, the latter feature higher values. Data presented for Argentina corresponds to average values for different stands (different locations and seed source) and ages (16, 17 and 20)[22]. In contrast, wood properties presented for Uruguay were measured for a single stand (12-year-old plantation in Rivera). Regarding Brazil, data presented corresponds to Lyptus timber from Aracruz plantations with rotations of approximately 15 years. Properties for plantation-grown *E. urograndis* exhibit high values. However, in this case, comparisons are for a hybrid of *E. grandis*, closely related but yet not the same species.

[22] Density and hardness variation among stands was reported to be not significant (Sánchez Acosta, 2003).

Table 5.4 *E. grandis*: A comparison of the species wood properties for plantation and native forests.

Species	Source of test material		Wood Property				
			Density (kg/m^3)	MoR (MPa)	MoE (GPa)	Janka Hardness (kN)	Moisture content of test material
Eucalyptus grandis	NATIVE FORESTS	Australia	620	122	17	7.5	12%
Eucalyptus grandis	PLANTATION	Uruguay	459	83	12	3.3	11%
Eucalyptus grandis	PLANTATION	Argentina	576	81	10	3.8	14%
Eucalyptus urograndis	PLANTATION	Brazil	650	118	14	6.4	12%

Source: Bootle (1983), Grupo Técnico de Madera Aserrada de Eucalipto GT2 (2004), Sánchez Acosta (2003), Weyerhaeuser (2002).

Notes:

1. The figures given for Janka hardness are an average for tangential and radial surfaces.
2. *E. urograndis* is a natural hybrid of *E. grandis x E. urophylla* widely planted in Brazil. Values correspond to "Lyptus" products.
3. Janka hardness and MoE for *E. urograndis* are average values for density over 600 kg/m^3 (Aracruz, company information).

CHAPTER 6 STRATEGIC MARKETING RECOMMENDATIONS

6.1 INTRODUCTION

The demand for hardwood lumber and related products is increasing as described in Chapter 2. There are positive indications about growing home construction/ renovation activity in the US for the next decade. Wood is viewed to be an accepted component in growth projections.

The traditional markets for hardwood wood products are Europe and the US. Increasingly China is entering into import log and lumber markets. This trend is expected to continue as China expands in re-export markets and grows internally. Concurrently, the available raw material international supply is decreasing due to depletion of tropical forests in South East Asia and environmental restrictions on logging tropical forests on an unsustainable basis.

Given this international background scenario, the developing world has increasing opportunities to expand the hardwood lumber business and related products. These opportunities do not just happen and in actual fact are harder for smaller countries/producers with new lesser-known plantation species, despite being environmentally friendly.

This chapter outlines the requirements for developing a successful products/markets strategy, following a theoretical marketing framework. The concepts involve likely product attributes, market research, segmenting, positioning with value-attributes, a targeting strategy and promotional activities. The industry competitive strategy is shown to be a "market-niche follower" with several indications for generic as well specific company branding. Considerations include a country trade marking programme under a "Buy Uruguay" label.

6.2 PRODUCT STRATEGY

Substitution opportunities and recommended product mix alternatives for Uruguayan *Eucalyptus grandis* are considered in this section focussing on value-added applications. Recent comparisons between the wood properties of *E. grandis* and other commercial hardwoods are cited. Flooring and furniture appear as two prospective solidwood applications. The importance of certification and product consistency is emphasized. Producing industrial grade lumber is a necessity but tends to be a low-end commodity without value-adding.

6.2.1 Species substitution in the international markets

Global preference for wood products and increasing consciousness for sustainably grown timbers offer bright substitution opportunities for certified *E. grandis*. Species substitution may differ with geographic markets and product segments, affected by temporary hardwood supply and prices. Above all, substitution by FSC certified *E. grandis* lumber has potential over increasingly scarce and more costly tropical hardwoods. The best outlook appears to be for flooring and garden furniture product segments where tropical hardwoods traditionally enjoy good demand.

A comparison between the wood properties of Uruguayan *E. grandis* and important commercial hardwood species in the international markets is intended:

- for identifying the timber strengths and weaknesses of Uruguayan *E. grandis*;
- as indicative of species and product substitution;
- as a point of reference for positioning.

Table 6.1 contrasts the wood density, MoR, MoE and Janka hardness of Uruguayan *E. grandis* and selected American, European, African and Asian hardwood species.

Table 6.1 A comparison of species: wood properties of similar hardwoods.

Species name - Trade name (source of material) T = tropical timbers		Density (kg/m^3)		MoR (MPa)	MoE (GPa)	Hardness (kN)
		Basic density	Density dry	Modulus of Rupture	Modulus of Elasticity	Janka
				at 12 % moisture content		
Eucalyptus grandis	**(Rivera-Uruguay)**	**432**	**459**	**83**	**12**	**3.3**
Shorea spp. - Philippine mahogany, dark red	(Philippine) T	-	-	83	12	3.2
Shorea spp. - Philippine mahogany, light red	(Philippine) T	-	440	78	11	2.6
Swietenia macrophylla -True mahogany	(Ctral-Sth. America) T	450	-	79	10	3.6
Shorea spp. - Meranti, light red	(Malaysia) T	-	-	88	11	2.8
Shorea spp. - Meranti, dark red	(Sabah) T	-	-	92	11	3.5
Entandrophragma cylindricum - Sapelli	(West Africa) T	-	670	110	12	6.7
Tectona grandis - Teak	(Burma/India) T	-	640/ 630	106/ 88	10/ 11	4.5/ 4.6
Hymenaea courbaril - Jatoba	(Brazil) T	710	-	134	15	10.5
Alnus rubra - Red alder	(US)	370	410	68	9.5	2.6
Prunus serotina - Black cherry	(US)	470	500	85	10	4.2
Acer saccharum - Sugar (hard) maple	(US)	560	630	109	13	6.4
Quercus spp. - White oak	(US)	570-880	640- 880	71-127	7.1-14.1	5.0 - 7.2
Quercus spp. - Red oak	(US)	520-610	590- 690	75-125	7.9-15.7	4.7- 6.7
Quercus spp. - European oak	(Europe)	-	690	97	10	5.5
Fagus silvatica - European Beech	(Italy/Great Britain)	-	675/ 690	108/ 118	10/ 13	5.7/ 6.4

Note: The figures given for Janka hardness are an average for tangential and radial surfaces.

Source: Grupo Técnico de Madera Aserrada de Eucalipto GT2 (2004), Bootle (1983), Forest Products Laboratory US (1999).

A preliminary approach on species substitution, based on the comparison of wood properties of several commercial hardwoods, shows that Rivera's *E. grandis* appears to closely resemble Philippine mahogany and within the North America hardwoods it stays close, but still below, American cherry. This is true in terms of timber colour as well (pale pink to pale red-brown) (Figure 6.1).

Eucalyptus grandis (Uruguay)

Philippine mahogany

Cherry

Figure 6.1 "Look alike" hardwoods: an example. Visual appearance of *E. grandis* (as a plantation hardwood), Philippine mahogany (as a tropical hardwood) and American cherry (as a temperate non-plantation hardwood).

Source: Pictures were sourced from Doldán (2001) and Dean Hardwoods (2004).

Tropical species substitution

Global supply of tropical timbers is affected by harvest bans and import restrictions which reflect the increasing environmental awareness taking place in both supply (although illegal harvest still takes place) and demand countries. Plantation-grown species have potential to substitute for tropical hardwoods. A 25% of Uruguayan *Eucalyptus* is already FSC or ISO certified which provides a competitive advantage. In addition, the species has similar wood properties to some tropical hardwoods highly appreciated for value-added applications in international markets. This is particularly the case for the mahoganies and merantis.

Substitution opportunities may exist for tropical South-East Asian species. Examples of hardwood species that are sourced from the region for high-value solidwood applications are the *Shorea* species, well-known and internationally demanded tropical hardwoods. Species of the *Shorea* genus receive different trade names determined by the area of supply: meranti when coming from Malaysia, Seraya from Indonesia and Philippine mahogany, or Lauan, from the Philippines (Australian Timber Importers Federation ATIF, 2004). For trading purposes, these timbers are grouped in reference to their colour in four classes: dark red, light red, yellow and white[23]. Uruguayan *E. grandis*, given the medium density level of the timber (460 kg/m^3) and its natural colour, can be at the level of light red *Shorea* species. Light red meranti and light red Philippine mahogany have similar mechanical properties to *E. grandis* (refer to Table 6.1 and Figure 6.2).

Uruguayan *E. grandis* also has similar mechanical wood properties to the "real" mahoganies (species under the genus *Swietenia*). Mahoganies sourced from natural forests in Central and South America have been included in the CITES list of endangered species[24] which means their trade is now regulated (CITES, 2004). Supply for these timbers will likely diminish and prices increase. Given this scenario, plus the similarities in wood properties, opportunities may well exist for substitution of mahogany with clear-grade, certified *E. grandis*.

[23] Sometimes, however, names are based more on wood density than on heartwood colour. Density increases for darker colours. Average dry density of 500 kg/m^3 for light red meranti and 680 kg/m^3 for dark red meranti (Australian Timber Importers Federation ATIF, 2004).
[24] In October 2003

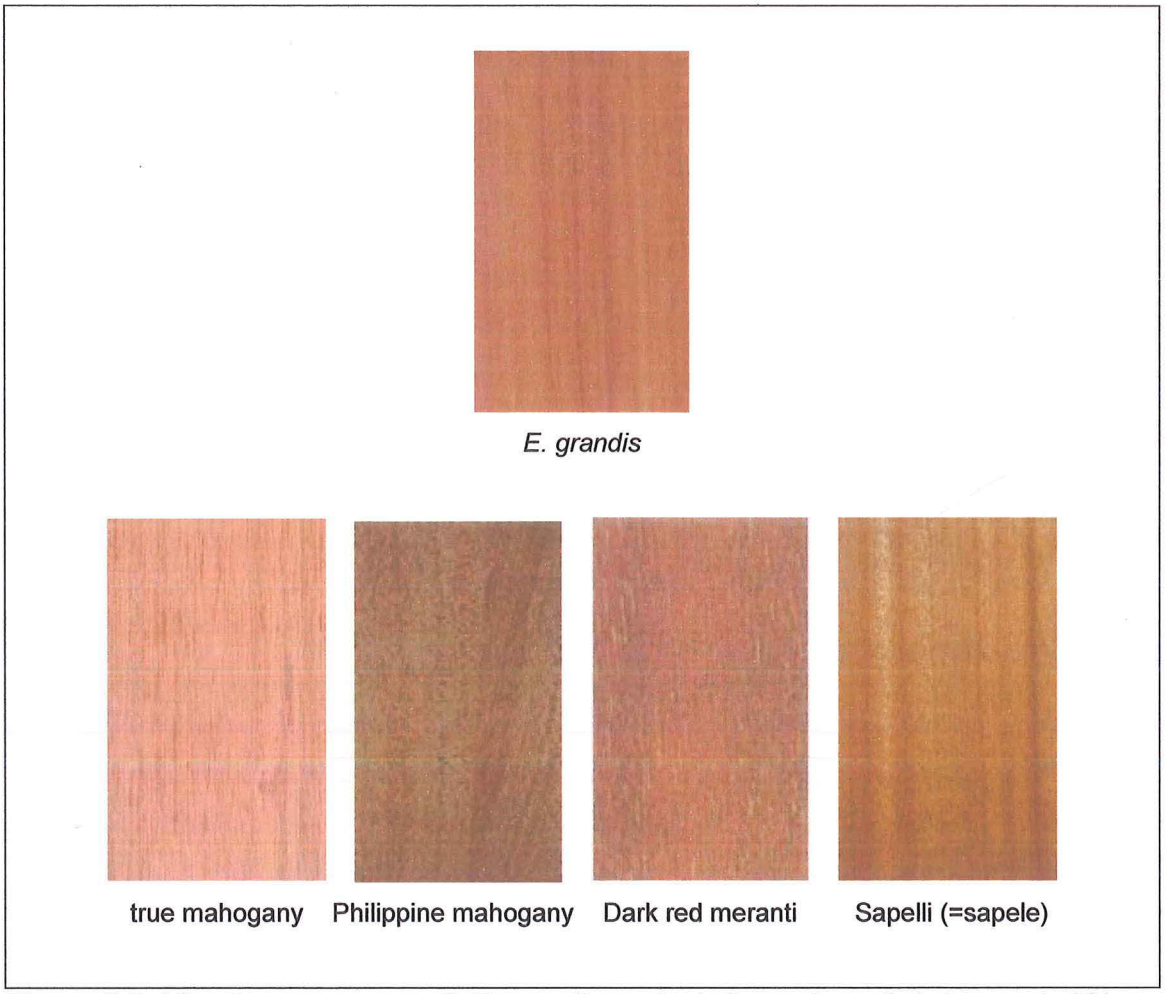

Figure 6.2 Visual appearance of *E. grandis* and similar coloured Asian and African hardwoods.

Source: tropical pictures from http://www.panda.org/downloads/forest/Tropical_Wood_images.pdf

E. grandis is considered a likely lower quality market-segment alternative for teak in the garden furniture marketplace (Donnelly et al., 2003b). This is based more on the need to find alternative mass-market hardwoods with higher availability and lower prices than teak, the traditionally used species, rather than the similarity in timber colour and figure. Despite this, the visual appearance of the product tends to rapidly change with exposure to weather[25]. Wood properties comparison between teak and *E. grandis* looks well for old growth Australian *E. grandis* (as both share similar wood properties) but still needs to be

[25] Weathering tests in Brazil that compared garden furniture of *E. grandis*, teak and jatoba showed that without surface treatment the three pieces of furniture took an almost identical grey appearance (Donnelly et al., 2003b).

considered as Uruguayan *E. grandis* is far below teak density and, not so far but still, below teak hardness. The key issue is to design products based upon specific properties. This product-development is already underway as Vietnam (major garden furniture manufacturer) is importing sawn timber logs from Uruguay with furniture production for EU markets.

Regarding natural timber durability teak heartwood is ranked as durable while Australian *E. grandis* is moderately durable (Bootle, 1983). Teak garden furniture can have a service life of 75 years[26]. The question here is whether customers would like to have garden furniture that lasts for a lifetime (or even more) or, otherwise, renew their furniture with future stylish and functional designs.

Wooden garden furniture, with not such a long-lasting option but a lower price alternative, is being considered by Smith and Hawken (North American garden supply retailer) as segmentation and "brand extension" of its garden furniture teak line. Smith and Hawken is open to complement its classical teak line with lower cost options (e.g. to offer a bench that retails in teak for US$ 499 with an alternative at US$ 299 in another species) (Donnelly pers. com., 2004).

[26] Some companies (e.g. Smith and Hawken) provide a life time guarantee.

North American hardwoods substitution: red oak, cherry and red alder

Uruguayan *E. grandis* may fit in the "look alike" group of cherry and red oak, native hardwoods grown in North America for high-value solidwood applications (Figure 6.3). Considering wood mechanical properties, Uruguayan *E. grandis* is slightly below cherry for values of Janka hardness but at similar levels of strength and stiffness. Differences with the red oak group are more pronounced in terms of hardness (the group has a wide range of hardness values but average hardness of Uruguayan *E. grandis* is even lower than low hardness red oak species). This suggests selective marketing programmes based upon density and hardness segregation.

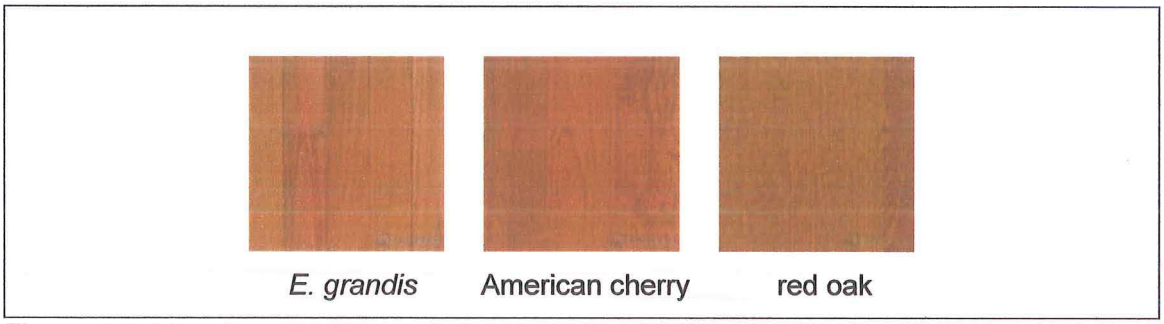

Figure 6.3 Visual appearance of cherry and red oak solid flooring vis-à-vis plantation-grown *E. grandis*.

Source: iFloor.com (2004).

One of the best North American substitution possibilities is flooring. The US flooring market has become saturated with red oak and is open to new and exotic species. This presents opportunities for alternative hardwoods with analogous wood properties and visual appearance to the classical red oak option (Donnelly pers. comm., 2004) (BR-111, 2003; Gunder, 2004). Brazilian hardwoods for instance are highly demanded for flooring applications in the US. *E. grandis* has similar visual appearance to some Brazilian flooring species that enjoy increasing acceptance in the US flooring market. Figure 6.4 shows the resemblance between *E. grandis* and a number of Brazilian indigenous hardwoods.

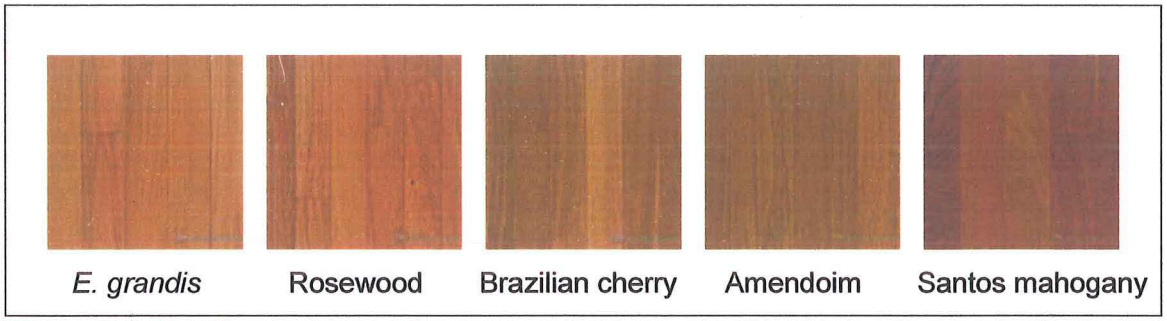

Figure 6.4 Brazilian hardwood flooring (solid strip flooring) – visual appearance of selected hardwood species available in the US market.

Source: Pictures were sourced from Indusparquet BR-111 (2004).

Both BR-111 and Weyerhaeuser (US) pioneered *Eucalyptus* flooring in the US starting in 2001-2003. Plantation *E. grandis* fits in the look-alike red (oak) flooring category. However, this was an option for the higher-end of the average natural colour ratings with higher wood hardness as well. This requires a strict sorting of the lumber, both based on colour and density. It is also necessary to consider that Uruguayan *E. grandis*, at least at this stage, does not score well for flooring options with high traffic wear while the formerly mentioned Brazilian hardwoods have indeed superior hardness and do qualify for commercial and residential applications, including high traffic areas. Comparisons with red oak flooring show unsegregated *E. grandis* has wider colour variation. Density stratification for sawn timber will reduce colour variation as well (colour increases as density increases). Colour variation is, however, the case for many hardwoods, including Brazilian hardwoods (BR-111, 2003). It is noted that Weyerhaeuser is not exporting to the US a light-coloured *Eucalyptus* flooring product. There are two successful categories: a natural (even colour) and "misclado" (with colour variation).

Red Alder may also offer substitution opportunities. Although red alder is reasonably available in the US it is strictly limited by region (American Hardwood Export Council (AHEC)). Also, the US alder market is largely dominated by one company which almost has a monopoly power of alder sawlog availability and prices (Donnelly pers. comm., 2004). Moreover, Uruguayan *E. grandis* has superior mechanical properties (refer to Table 6.1 for a comparison of species).

6.2.2 Secondary processed wood products

There are many undifferentiated commodity type hardwoods and *Eucalyptus* is one of the new entrants. Hence, the manufacture of value-added, secondary processed *E. grandis* products is recommended to differentiate its attributes, escaping competition from alternative woods (hardwoods and softwoods) and non wood materials (e.g. plastics, metals, carpets and others) in the international markets. Based on the species attributes, other countries' success and global hardwood trends, opportunities may well exist for Uruguay to produce and market secondary processed *Eucalyptus* products. For prospective Uruguayan manufacturers entering this product segment the trends are:

- there is a move away from the prevailing PPWP exports where Uruguay is a minor player in the international hardwoods trade and, in consequence, highly exposed to cyclical prices and trade fluctuations;
- competition is more limited (when compared to the commodity trade scenario where plantation eucalypts from Uruguay fall into the global pool of low value materials to be processed overseas and is predisposed to lose its identity in the marketplace);
- opportunities for product differentiation increase while upgrading products along the value-added chain (this relies on product development and marketing investment too);
- higher prices can be set (as there is a chance to reach end-use markets with remanufactured, value-added products specifically designed to meet the customer expectations);
- distant markets can be reached (price competitiveness helps afford higher freight costs).

6.2.3 Recommended product mix alternatives for Uruguay

Based upon current trends and market research, the suggested product mix alternatives to focus on are builders' joinery and carpentry (BJC) and furniture products. Solidwood products can be produced entirely from lumber, or in combination with veneer/plywood[27]. Particular end uses recommended for Uruguayan *E. grandis* are solid strip flooring, engineered flooring and moulding within the BJC products group, and furniture and furniture components (see Figure 6.5 below). Indeed, a complete line of housing "solutions" can be offered.

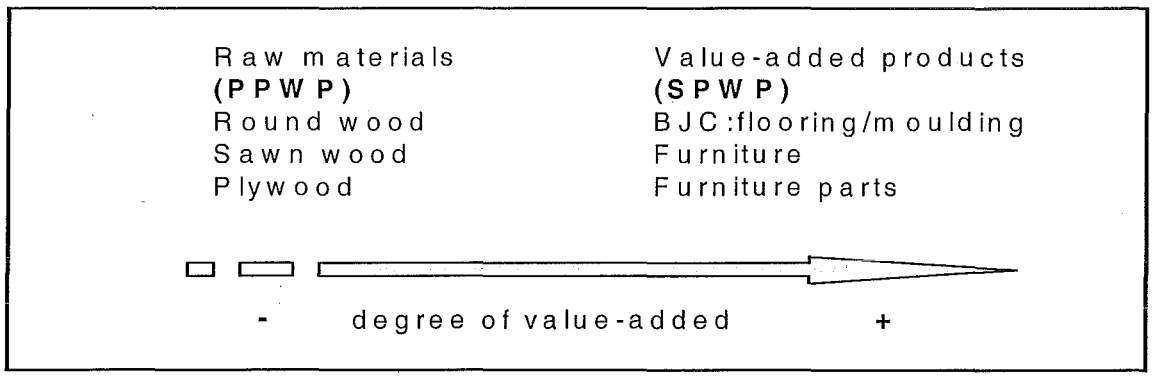

Figure 6.5 *Eucalyptus grandis*– solidwood product options.

Notes: PPWP = Primary processed wood products; SPWP = Secondary processed wood products

Subject to veneer/plywood facilities being available in Uruguay for the processing of eucalypts[28], it may be feasible to think of facilities for combined saw and veneer log utilization. This will aim for an optimal use of the stems while upgrading lower quality logs. Assuming an intensive silvicultural management with trees pruned up to 8-10 metres height, pruned logs with large diameters can be used for lumber production (e.g. for furniture and solid strip flooring). This will include the first log of the trees and a number of second logs (depending on the desired log length, tending and site conditions). The subsequent logs, with a smaller diameter (again the number of logs to be obtained depends on the specified log length) can be allocated to the veneer/plywood facility for the later manufacture of furniture and engineered flooring.

[27] The use of other wood-based panels (fibreboard, particleboard) and engineered wood products (glulam, LVL, OSL, others) is beyond the scope of this study.

[28] Weyerhaeuser is building a pine and eucalypt veneer/plywood mill close to their forests (Northern Uruguay).

6.2.4 Builders' joinery and carpentry: flooring and moulding

The production of *E. grandis* flooring has been undertaken by some Uruguayan companies. Further projects are also being contemplated. Undoubtedly, significant opportunities remain for expanding the Uruguayan flooring sector. So far, the industry faces a limited supply of high-grade raw material.

Considerations for flooring

Several studies have assessed the lumber properties of Uruguayan *E. grandis*. Some issues regarding its suitability for flooring production are worth being considered. Key limitations to overcome in view of flooring production with Uruguayan *E. grandis* lumber are:

a- Relatively low Janka hardness value – Hardness, a property of wood that enables it to resist indentation, is a restrictive factor for wooden flooring production. Artificial methods for increasing surface hardness are nowadays available, yet an increase in the wood's hardness is desired.

b- Janka hardness variation – It is important for wooden flooring to have a uniform hardness in order to perform satisfactorily.

c- Colour variation/natural features- Although colour is not a limiting factor for final solidwood applications it plays an important role for the production of flooring and furniture where components of the same species need to be joined and colour consistency is generally required. However, colour is an aesthetic property subject to consumer preferences and fashion trends. Product-market developments for similar hardwood products have differentiated three categories: clear, natural (features) and rustic grades. In some cases the rustic grades sells at a higher price than the clear grade.

Part of the product-development task is to devise solutions and/or alternatives where perceived weaknesses arise for flooring. There are several ameliorating options:

a- Increasing wood density will increase Janka hardness. Considering the strong and positive linear relationship evidenced for the species between the two properties there is potential to increase the overall value of hardness through genetic breeding in favour of density (highly heritable property). As hardness increases flooring can cover more applications. However this is a long term solution requiring at least one rotation (16 years or so).

It is useful to calculate with the hardness-density equation the density level that will be required to reach red oak hardness. Red oak (a group of oak species) is the popular wood flooring in the US. The lower Janka hardness for the red oak group is 4.7 kN. Based on the wood density and Janka hardness relationship found by Böthig (2001) for *E. grandis* heartwood an estimated wood density of 583 kg/m^3 is required to reach a hardness value (tangential Janka) of 4.7 kN. As previously presented in Table 5.2 today's average heartwood and sapwood wood density is 459 kg/m^3 (for 12-year-old material)[29].

b- Density sorting to reduce Janka hardness variation. Sorting the lumber by density, i.e. indirectly sorting by hardness, will be advantageous to attain more even products. Depending on its density, lumber can be segregated for different flooring applications. High hardness is required for "high traffic areas" (e.g. commercial, industrial and some housing areas). "Light transit areas" can stand for lower hardness floors (e.g. bedrooms). Japan, a country where people wear no shoes in their houses, is a potential market for lower density floors (Davison, 2000). Aracruz, Brazilian grower and manufacturer of *Eucalyptus* "Lyptus" products, is successfully sorting kiln-dried lumber[30] into three density classes: (I) less than 536 kg/m^3 (II) 536 - 725 kg/m^3 (III) greater than 725 kg/m^3. This classification was developed to reduce large variation in density (mainly due to the species mixture that includes high density clonal material) while segregating products by density class

[29] Note that *E. grandis* in Argentinean plantations is at the 576 kg/m^3 density level; yet Janka hardness is 3.8 kN (still below red oak hardness of 4.7 kN). Average values for Argentinean *E. grandis* are presented in Chapter 5.

[30] Surfaced lumber density is measured electronically during processing and each piece is marked and segregated (Donnelly et al., 2003b).

(Donnelly et al., 2003b). The low density and light coloured flooring is not exported to North America.

c- Colour grading and natural features grading to reduce variation. Uruguayan *E. grandis* has important colour variation. The same applies to other natural features such as borer holes, kino venation and sound knots. Here again niche markets can be found as natural features are sought for "rustic" or "character" floors and colour variation is suitable for mosaic flooring. Still, it is widely accepted that appearance consistency is important. Lumber should be sorted into natural feature grade material and select grade material before being further processed. Lastly, steaming the product prior to final kiln drying makes the colour more uniform and darker (Aracruz company information).

Another issue for Uruguayan flooring producers is the colour change of the final product over time[31]. Colour stabilizes approximately three months after flooring installation. A finishing product with UV inhibitors will help slow the darkening process.

Particularly for products to be exported (and this applies to all processed wood products) the moisture content of the product needs to be specified[32]. For wooden flooring it is important to consider the humidity where the product will finally be installed. Change of flooring moisture content after installation may lead to noticeable change of size (e.g. shrinkage and swelling). Moisture content is particularly important for flooring to be installed over heating and in air conditioned buildings (Appendix 4 shows MC guidelines for New Zealand). For the production of floating flooring, stiffness of the material (MoE) is the critical property.

[31] Colour change is true for other hardwoods as well.
[32] Typically, *Eucalyptus* flooring exports from Brazil are in the range of 6 - 8% MC with a full plastic wrap cover (4-sided) to arrive at the end-use destination at less than the required MC without incurring condensation damage (fungus stain, etc.) (Donnelly, pers. com., 2004).

Flooring type options for Uruguay

Uruguayan *E. grandis* is suitable for several flooring types. Options range from solidwood flooring to engineered flooring, strip/plank/tile-parquet floors and even floating floors. Opportunities include the production of:

A. Solidwood strip flooring. Clear or finger-joint[33] to be nailed down to a wood sub-floor and tongue and groove floors (Figure 6.6).

B. Engineered flooring. The production of engineered flooring in Uruguay can offer a utilization alternative for smaller diameter logs. This can also be a good option for solving the density-hardness limitation of the species. Several options exist for Uruguay including composite products with layers of different grades and species. One product option consists of layers of *Eucalyptus* with an appearance high-grade face veneer (outer layer) and inner plies of lower veneer grades. In addition, plantation pines from Uruguay can be used as a way to add value to this resource as well. Combined hardwood/softwood flooring can be obtained with pine and eucalypt layers (pine core veneer with clear faces of *Eucalyptus*).

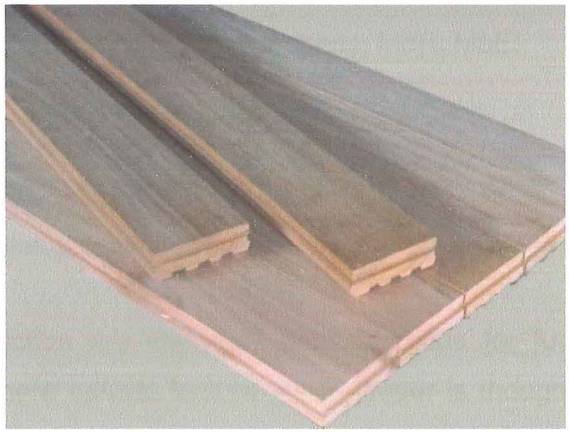

Figure 6.6 Finger-joint flooring produced by URUFOR from plantation-grown *E. grandis*.

[33] Finger-jointing allows for a better use of small lumber dimensions. It is an option for utilizing pruned thinning logs (and is currently been used in Uruguay for the production of *E. grandis* moulding and flooring). However, the "zipper" system in the face of the boards can limit the quality appearance grade of the product.

Where flooring is unsuitable, similar quality material (lower density) can be manufactured into wall panelling, with a similar tongue and groove profiling.

Flooring accessories in reality are required for flooring edges, internal stairs and others. The production of solid moulding can be considered in association to flooring production.

6.2.5 Furniture

Furniture and furniture components for interior and exterior use (garden furniture) are also prospective value-added products for Uruguayan *E. grandis*. Already, Vietnam and SE Asia are importing Uruguayan *E. grandis* for furniture manufacturing.

Considerations for furniture production

The production of furniture and furniture parts for export markets implies an understanding of the natural properties of *E. grandis*. Raw material requirements for furniture production include:

- defect free timber;
- suitable values for the properties: hardness, MoR, MoE;
- dimensional stability;
- colour consistency;
- natural durability;
- machinability/ gluing/ finishing.

Design, style and function are important considerations for furniture. In contrast with flooring production, where natural feature grade timber is thought to find niche markets, timber with natural defects should be, in general, excluded for furniture production. In furniture parts where structural strength is important, knots and pin borer holes result in timber weakness. However, industrial grade timber with "imperfections" can be valuable for decorative purposes as long as it does not affect the performance of the product (Ozarska, 2000).

Furniture must be designed considering the type of load the product will carry in service. Desirable values for highly stressed furniture components of *E. grandis* are modulus of elasticity of at least 12 GPa and modulus of rupture of at least 80 MPa (Ozarska, 2000). Reported average values for these properties in Northern Uruguay of 12 GPa and 83 MPa respectively show that the lumber reaches the minimum desirable values. Moreover, with density sorting of the sawn timber and future genetic breeding aiming for wood density increase mechanical properties of MoR and MoE are likely to increase. So far, average values make the timber suitable for furniture production. Note that this inference only considers the species raw material properties and does not take into account processing costs and factors that determine market acceptance including design.

High values of mechanical wood properties are important for furniture components that are liable to high wear and marking (e.g. tops and bench tops) and parts where structural strength is important (e.g. chair legs). Moisture content of the timber should be specified as well. Moisture changes will result in unfavourable movement of furniture parts.

Garden furniture- Garden furniture is usually exposed to sunlight, rain and dew. Weathering causes the pale colour of *E. grandis* to darken (due to oxidation) and, after exposure to continued wetness, furniture surfaces become grey.

The fundamental requirement for the wood to be used for garden furniture is suitable durability in exposed situations and weight. Weathering tests in Brazil have been successfully conducted to ascertain product durability in several geographic locations. Lumber durability (and product life service) may vary with location and climatic factors which encourage differing hazards of decay and insect attack. Typically, garden furniture requires over-winter protection and annual renewal of a preservative treatment.

Timber weight is also important for furniture production. Heavy garden furniture can be perceived as a disadvantage. Uruguayan *E. grandis* is of medium density and is not restricted in terms of weight for furniture applications. Other native hardwoods such as red gums have naturally durable heartwood but are too heavy to be used for furniture. Weight problems were also reported for Brazilian cherry (Jatoba) (Donnelly et al., 2003b).

In addition to the general considerations for furniture production, particular research considerations for garden furniture include ways to extend the product life service:

- preservative treatment;
- surface finishes;
- product service life: range of years + product maintenance requirements + effective communication to final users.

These considerations should be included in industry and government research programmes.

Interior furniture- With investment in design, interior furniture for residential use (dining, bedrooms), offices and the hospitably sector could offer higher value options than garden furniture. A whole line of furniture could be designed for particular end market preferences and stained to match the preferred hardwood species for that market. The fact that *E. grandis* can be easily stained to match other coloured hardwoods is a competitive advantage of the species.

Again, there are finishing and design research aspects to be evaluated in building a prosperous furniture industry segment. These aspects in part relate to a new lesser-known species with unknown properties. It is noted that the University of Melbourne, Australia, has a special programme in utilizing "young *Eucalyptus*" for furniture. These research aspects should be evaluated for Uruguay.

6.2.6 Value-proposition and positioning

The value-proposition: Evidencing the "distinctiveness" of Uruguayan eucalypts

Distinctive product attributes that identify the Uruguayan eucalypts and the benefits that these will imply for the customers should be stated in industry generic and company specific value-propositions[34]. A specific proposition will be required for each final product, or group of products, intended for each target market. It is clear that, despite the globalization of markets and resulting commonality, there still exists particular preferences by market (Levitt, 1986). Regarding solidwood products, market preferences still differ for product specifications, colour, design and others. Research in each end market is needed to identify the specific customer needs for a particular product.

The value-proposition needs to be prescribed based on a few selected and salient attributes, highlighting where *E. grandis* best matches the identified customers needs and wants. Appendix 5 provides a summary of the main factors that influence sales of solidwood furniture in four countries. Quality, design, species and "green attributes" (certification) were among the first ranked attributes that influence consumers buying decision for wooden furniture in New Zealand, Australia, Finland and Germany (Bigsby & Ozanne, 2003; Kärki, 2000; Pakarinen & Asikainen, 2001). Price was not at the top of the ranking list in any of these references. References illustrate large differences in the perception of wooden furniture attributes for different countries and product segments. If *E. grandis* products are to be offered in these market segments, the proposition should complement the identified key attributes.

At this point, however, a generic value-proposition can be formulated. A preliminary value-proposition for the nation's plantation-grown resource that is managed under clearwood regimes is presented in Table 6.2. Uruguayan *E. grandis* is expected to be a high quality

[34] As quoted from Kotler & Armstrong (2004) "The marketing objective is to position the brands on the key benefits that they offer relative to competing brands. The full positioning of a brand is called the brand's value proposition, the full mix of benefits upon which the brand is positioned. It is the answer to the customer's question: Why should I buy your brand?". For example, Carter Holt Harvey laminated veneer lumber (LVL) value propositions are defined for each target market segment as lower-total cost and no call-backs (residential), safety (scaffolding) and engineered, cost-effective (housing) (Priest pers. com., 2003).

hardwood timber, nice rose coloured, suitable for appearance products. Specific company value propositions can be related to product positioning, branding and promotion.

Table 6.2 Recommended "value for money" proposition for plantation-grown *E. grandis*.

Uruguayan *Eucalyptus grandis:* A hardwood that features:
▸ green credentials
▸ plantation source
▸ appearance lumber
▸ clear grades
▸ ease of workability
▸ attractive colour: pale rose to reddish
▸ suitable for high-value end-use applications (including appearance solidwood products)

Positioning

The value-proposition helps position product/s at the target level of substitution options. Uruguayan plantation-grown *E. grandis* can be positioned as a **temperate hardwood** of **medium density** and **light to medium colour** intended for high-value applications as furniture and builders' joinery and carpentry. The commercial hardwood timbers of the world can be classified with respect to their air dry density in six density groups as follows (Table 6.3):

Table 6.3 Commonly accepted grouping of timbers based on its density.

Species ranking	Density at 12% MC (kg/m^3)
Exceptionally light	< 300
Light	300 - 450
Medium	**450 – 650**
Heavy	650 - 800
Very heavy	800 - 1 000
Exceptionally heavy	> 1 000

Based on this classification Uruguayan *E. grandis* is at the lower end of the medium density range.

A wood properties comparison of Uruguayan *E. grandis* and selected hardwood species is a guide to the positioning exercise. As the preferred wood species varies with market, the positioning of *E. grandis* at the level of substitute hardwoods needs to change with target market. Lyptus products for instance, have a geographic market positioning. They are positioned as a green alternative to Philippine mahogany and cherry in the North American markets (in both instances at a discounted price as it will be later discussed in the Pricing Policy section), but a plantation eucalypts and tropical species alternative in the Australian market (Phillips, 2002; PineSolutions, 2004).

For each product segment and market Uruguayan *E. grandis* products are suggested to be positioned in relation to the preferred wood species with comparable properties. Once a replacement option is identified, the competitive advantages of *E. grandis* over the "comparable" product/s become the product strengths (e.g. certification; reliable supply from plantation sources versus uncertain supply from tropical forests). The identification of substitution opportunities and positioning is an exercise to be conducted on a product-market basis.

6.3 BRANDING CONSIDERATIONS

Brand names are used to interest and/or attract customers. A brand name identifies the product and its attributes. Ideally, the branding reinforces the positioning and the value-proposition. This section accentuates the importance of branding as a strategic way to differentiate Uruguayan *Eucalyptus* solidwood products in export markets. Different approaches for brand- naming *Eucalyptus* are presented and discussed.

6.3.1 Implications of the name *Eucalyptus*: limitations to overcome

The genus *Eucalyptus* has a multi-purpose and commodity products background. To some extent this is due to the fact that the genus accounts for 700 species (Australian Government Department of Agriculture Fisheries and Forestry, 2004) and that some of them have been established outside their natural area of occurrence with different degrees of success.

Today, even though many countries grow *Eucalyptus* on a plantation-based regime, Australia still remains the major *Eucalyptus* lumber supplier (Donnelly et al., 2003b). The fact that *Eucalyptus* lumber primarily comes from native forests in Australia, and its generalized multi-purpose implications, are important features to consider when assessing the international perception of the genus.

Traditional, and still common, uses of *Eucalyptus* are raw materials for the pulp and paper short fibre industry and fuel. Other uses include the production of essential oils, important for the pharmaceutical and aromatherapy industry. However, there is little international recognition for quality, appearance *Eucalyptus* solidwood products. Research on this area has shown that at a global scale, the word *Eucalyptus* may lead to some of the following labelling: cheap timber (because it grows fast), firewood material, useful to stop smoking and to prevent colds (Donnelly et al., 2003b).

Contrary to this perception, plantation-grown *Eucalyptus* when managed on short and intense regimes has proved to yield high quality clear timber[35]. As well as in other countries, this is the reality for some *Eucalyptus grandis* plantations in Uruguay. Yet, *E. grandis* is a lesser-known species and new product in international hardwood markets.

The limited availability and acceptance of *Eucalyptus* as a high quality commercial timber is an important issue the Uruguayan export oriented solidwood *Eucalyptus* industry needs to consider. Acknowledging this fact is a good starting point for the sector and the government. Given the "lesser-known species syndrome", strategic branding, value propositions and promotion are market introduction imperatives.

6.3.2 Strong species/product branding is required

Branding efforts are fundamental for marketing plantation-grown *E. grandis* overseas. Branding is recommended to be used as a tool for differentiating Uruguayan products.

Apart from the specific company brands (i.e. product branding), the development of a national branding or "trade marking" for Uruguayan Plantation Timbers is suggested. In this regard several options exists from a broad national branding that covers all pine and eucalypt species[36] to a hardwood branding that restricts its coverage to *Eucalyptus* species. As will be discussed later, a national brand-name is suggested to be part of a national image within a state timber/forest products promotion that is suggested to be conducted with government and industry assistance (discussed in the Promotion Section). Branding should be a structured approach with generic and company branding plus a national trade market and promotion "Buy Uruguay".

Very few branding strategies have been reported for plantation-grown *Eucalyptus* products. Still, *Eucalyptus* is largely considered an inappropriate brand name. Aracruz has developed a brand identity for its Brazilian eucalypt products by calling it Lyptus[37]. This is indicative of Aracruz's move away from the commodity business. Aracruz believed that to introduce itself and its products outside Latin America differentiation through branded

[35] This process includes selected breeding material, favorable site conditions, investment in silviculture and processing techniques (e.g. drying, sawing).
[36] Note that in Uruguay all commercial forest exports are from plantation species.
[37] Lyptus ™ brand name and visual identity were created by Aracruz and Lippincott & Margulies.

products was required (Lippincott Mercer, 1999). Outside the *Eucalyptus* arena, many companies are emphasizing the importance of an effective branding strategy for differentiating its products from the competitors' (Abbot, 2004). This has also been true for the New Zealand Merino Company (NZ Merino) who developed a brand identity for the Merino fibre the company markets in New Zealand and abroad (Scott Champion, pers. com., 2004). The NZ Merino "story" will be further discussed in the Promotion Section.

6.3.3 Branding needs to be correlated with the value proposition

The idea behind a brand name is to communicate positive attributes of the product to the consumers. The brand strategy needs to support the value proposition and product positioning. Indeed, an effective brand name will communicate the physical differential advantages of the product that is being marketed and the "promise" that derives from the superior product attributes (e.g. Duracell batteries and Golden Edge MDF). The superior characteristics of Uruguayan *E. grandis* solidwood products (i.e. plantation-based, ecologically-sound, high quality appearance and others) should be incorporated in the brand strategy.

6.3.4 Brand-naming Uruguayan *E. grandis* products

Once the eucalyptus solidwood sector is established in Uruguay, different branding names for *Eucalyptus* products may develop. This may be the result of different manufacturers branding their products for different markets. Uruguayan companies that export *Eucalyptus* solidwood products outside the country may possibly use their existing brand name. Weyerhaeuser, for instance, may take advantage of the company expertise in selling Aracruz branded products Lyptus[38]. It is likely that Weyerhaeuser, Colonvade in Uruguay, will incorporate the *E. grandis* products the company will produce in Uruguay under the same brand name.

Regarding export trade names of *E. grandis* a "rose gum" or "flooded gum" designation is given to the species in Australia. In Uruguay, "red grandis" has been reported to be used.

[38] This conjecture is further supported by Weyerhaeuser acquisition of 2/3 of Aracruz Produtos Madeira S.A. in November 2004.

Urufor has made some export shipments of solidwood *E. grandis* products under the "red grandis" trade designation (Donnelly pers. com., 2004).

General recommendations for brand-naming Uruguayan *E. grandis* products include:

- avoiding the word *Eucalyptus* (because of its broad and negative connotation);
- including a geographical (national or regional) reference;
- considering language/cultural issues in end markets (a name in English/Spanish);
- being creative.

It is suggested to avoid the generic name *"Eucalyptus"* and any short form of it. As Donnelly et al. (2003b) observed, an internet search for Lyptus will result in a extensive list of results as –lyptus matches with mentho-lyptus as well. Likewise, an alias with the term "Euca" will match all Euca-lyptus results. Unlike most Latin generic names, *Eucalyptus* is accepted worldwide[39].

Trade names can be used as a reference for branding (Donnelly et al., 2003b). Frequently, hardwoods (and softwoods too) receive a trade name to allude to a wood they resemble although they are botanically unrelated to it (e.g. Brazilian cherry, Brazilian walnut, African mahogany, Philippine mahogany).

Eucalyptus lumber has received a variety of trade designations. Several eucalypt species have been branded with respect to hardwoods they resemble. There is frequent allusion to the North American ash and oak hardwoods (Table 6.4 and Table 6.5).

[39] In some way this is similar to the association of New Zealand silver beech with the European beech. This was reported as a threat for the market development of silver beech in Europe. Branding silver beech with a non beech name was suggested (Thompson, 2003).

Table 6.4 *Eucalyptus* trade names: Australian examples

Trade name	*Eucalyptus* species
Rose gum/ Flooded gum	*E. grandis*
Alpine ash	*E. delegatensis*
Blackbutt	*E. pilularis*
Blue gum	*E. globulus*
Jarrah	*E. marginata*
Karri	*E. diversicolor*
Spotted gum	*E. maculata (Corymbia maculata)*
Sydney blue gum	*E. saligna*
Tasmanian oak	*E. regnans, E. obliqua, E. delegatensis*
Victorian ash	*E. regnans, E. delegatensis*
Mountain ash	*E. regnans*

Source: Standards Australia/Standards New Zealand (2001); Donnelly et al. (2003b).

For the same species, different trade names may exist depending on the exporting country and, in the case of Australian natural forests, the region supplying the lumber. *Eucalyptus delegatensis*, for instance, is known by the trade name designation of Victorian ash, Tasmanian oak and Alpine ash (Table 6.4).

Table 6.5 *Eucalyptus* trade names: examples of plantation-grown species

Trade name	*Eucalyptus* species	Country of origin
Red grandis	*E. grandis*	Uruguay
Chilean oak	*E. globulus, E. viminalis, E. camaldulensis*	Chile
Lyptus	*E. urograndis*	Brazil
Leda	*E. deglupta*	Indonesia
Kamarere	*E. deglupta*	Malaysia
Bagras	*E. deglupta*	Philippines
Saligna	*E. saligna*	South Africa

Source: Simula and Tissari (1998); Donnelly et al. (2003b).

In some cases the name reflects an aggregation of species with a wide variation in wood properties, colour, etc. This is common for Australian and Chilean eucalypts and tropical hardwoods as well. Tasmanian oak is the export name for three eucalypt timbers (*E. regnans, E. obliqua* and *E. delegatensis*) known and sold by distinctive names in

Australia. Similarly, Chilean oak is the export name of three Chilean-grown eucalypt species.

A single species, original identity for brand-naming *E. grandis* may be considered for Uruguay. Some brand-name options for Uruguayan *E. grandis* exporters are to use the Australian trade name for the species (rose gum) and/or to include a geographical reference (e.g. Rivera/ Litoral/ Uruguayan rose gum) or Uruguayan rose, a plantation hardwood.

6.4 PRICING POLICY

Price competitiveness is important for developing and maintaining markets for Uruguayan *Eucalyptus* solidwood products. For each product and market it is recommended that price is set in relation to the price of substitute hardwoods and the positioning strategy. An initial low price strategy should be avoided, as it is difficult to recover from. New Zealand radiata pine serves as a case in point, where low pricing in Japan was difficult to overcome.

6.4.1 Introduction

Three suggestions regarding the future pricing policy of Uruguayan *Eucalyptus* solidwood products are presented.

- Use substitute species as a "benchmark".
- Enter new markets with secondary processed wood products (SPWP) from the beginning (i.e. value-adding).
- Avoid an initial low price policy.

6.4.2 Use substitute species as a strategic benchmark

It is suggested that suitable benchmark species should be first identified and used as a point of reference for the creation of *Eucalyptus* pricing policies. Afterwards, Uruguayan *Eucalyptus* products should be placed on a realistic range between the selected benchmark species (Simula & Tissari, 1998). The competitive strategy, in this case, is a follower in niche marketing (Kotler & Armstrong, 2004).

Particular price policies should be elaborated for each market and product segments (or end-use sectors) as wood preferences differ and so will benchmark species. Prices of *Eucalyptus* solidwood products that have already being introduced in specific marketplaces are good starting points to consider. Particularly for the United States (US) market, Lyptus positioning and pricing should be considered as a reference, and the pricing rationale: eco-friendly, genetically improved, carefully tended with equivalent or higher costs than native substitutes.

6.4.3 Pricing reference for *Eucalyptus* solidwood products in the US market

The most relevant illustration for the Uruguayan *Eucalyptus* solidwood industry are Lyptus products, distributed and marketed in the US by Weyerhaeuser.

Weyerhaeuser states that Lyptus is a high quality, lumber product, a substitute for other hardwoods. Based upon its market research, Lyptus is positioned accordingly to selected hardwood species (presented in Figure 6.7).

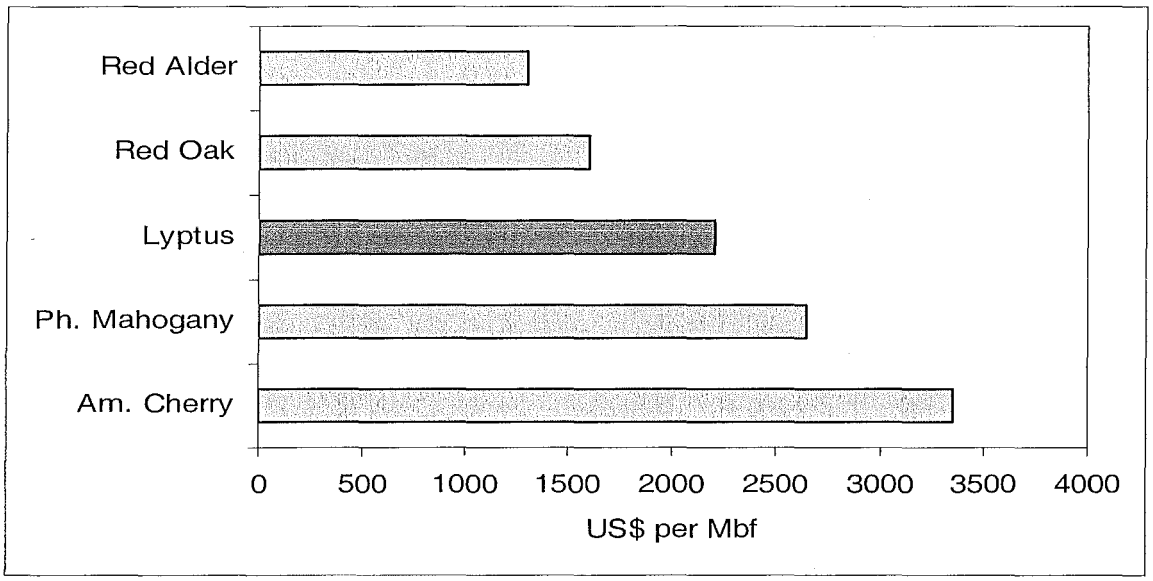

Figure 6.7 Positioning *Eucalyptus* lumber in the United States market: Lyptus lumber prices, 2002. Wholesale price level for First and Seconds (FAS) and No. 1 Common grades.

Source: modified from Donnelly et al. (2003b).

Lyptus products are priced with reference to red alder, red oak, cherry and walnut as domestic US hardwoods and Philippine mahogany, jarrah and jatoba as imported hardwoods. For FAS grade lumber (refer to NHLA grading rules in Appendix 6) in 2002, Lyptus was positioned at the wholesale price level of US$ 2200 per Mbf. When comparing the Lyptus price with the price of other hardwood species, Lyptus is being priced above the red alder and red oak level (+70% and almost +40% respectively), but below Philippine mahogany (almost 10% below) and cherry (almost 30% below) (Figure 6.7).

It is important to note that although Lyptus is priced above red alder and red oak, Weyerhaeuser is not looking for direct substitution for these hardwood species. On the contrary, Lyptus is offered as a comparable alternative to pricier hardwoods such as cherry and Philippine mahogany. As stated by Ian Firth, Appearance Wood Products Manager for Weyerhaeuser, the company is selling Lyptus discounted 10 to 30 percent against the price points of cherry and mahogany (Phillips, 2002). Weyerhaeuser's rationale is to position Lyptus with respect to upstream substitute species, but at a discounted price.

Similarly, Brazilian *E. grandis* solid strip flooring (rose gum in Figure 6.8) is being positioned in the US market by Weyerhaeuser at a higher price level than red oak (+70%) and Santos mahogany (+35%). As Figure 6.8 shows, *E. grandis* solid strip flooring is positioned at about US$ 7.5 per Sq.Ft. (retail price); somewhere in between the imported Jatoba and the domestic American cherry and walnut (these two last ones share the same price level). In relation to other eucalypt species *E. grandis* is, however, positioned at a lower price than Sydney blue gum and Jarrah (-10% in both instances). Both of these native products were identified as popular and with limited US supply availability, also higher density ratings.

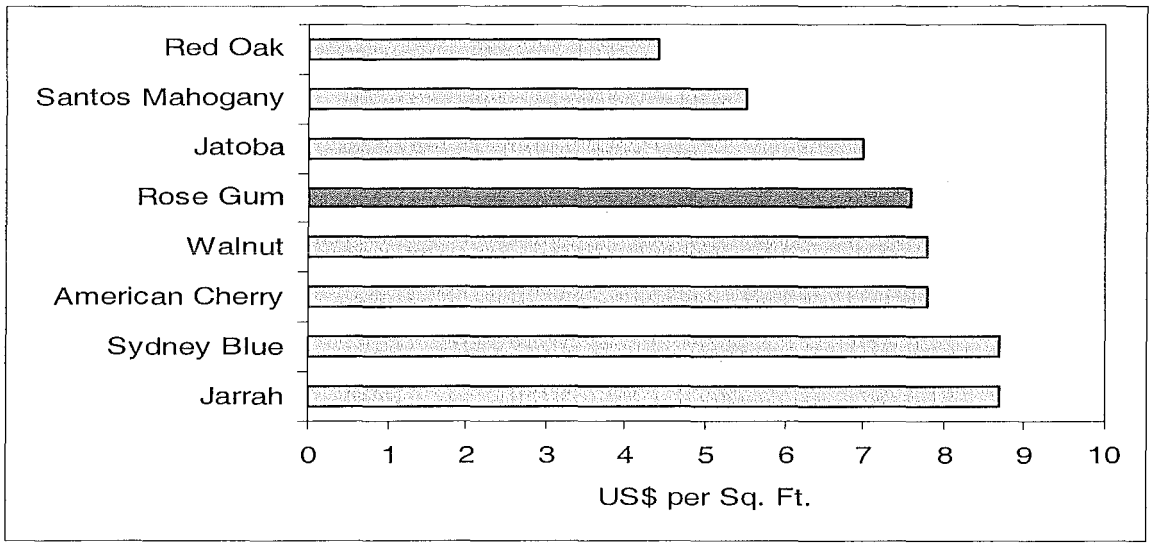

Figure 6.8 Positioning *Eucalyptus* solid strip flooring (¾" x 3") in the US: hardwood retail prices, 2002.

Source: based on Donnelly et al. (2003b).

6.4.4 Enter new markets with SPWP at the beginning

It is recommended that Uruguayan remanufactured *Eucalyptus* products are part of the marketing strategy from the beginning. This is the best way of creating acceptable price levels for plantation-grown *E. grandis* and derived demand for intermediate products.

Difficulties faced by New Zealand for the introduction of secondary processed radiata pine products in the Japanese market are thought to be due to the initial low value market perception that restricted the use of the species to the low-quality utility segments (e.g. pallets). In this case, starting with primary processed wood products (PPWP) at low prices resulted in NZ radiata pine been labelled as a low quality species (Simula & Tissari, 1998).

6.4.5 Avoid an initial low price policy

Uruguayan plantation-grown *Eucalyptus*, as a high-valued, fully qualified hardwood for a multitude of end-use applications should avoid a low price introductory marketing strategy. The investment that is required to obtain quality wood (e.g. plantation, tending processing and other costs) should be reflected in the species value proposition and pricing.

Starting with a low price policy may ruin the image of *Eucalyptus* and likely affect its future trade. This was the case of several introduced species such as Malaysian rubberwood, which has not been able to revoke its cheap timber image even in secondary processed product lines (Simula & Tissari, 1998).

6.5 STRATEGIC PARTNERING ACROSS THE SUPPLY CHAIN

The creation of strategic alliances to accomplish market entry and gain insight to new markets and product segments is presented in this section as an opportunity for the early Uruguayan *Eucalyptus grandis* solidwood products industry. The benefits of partnering across the supply chain are exemplified by pertinent case studies. For Uruguay, as a small country with a lesser-known species, the fundamental propositions are to reduce business risks and build market position.

6.5.1 Factors that drive in the direction of alliances

The globalization phenomenon has opened once-closed markets and created new opportunities for global companies. From a corporate point of view, these encouraging opportunities also present new threats: how to effectively compete with the experienced domestic companies. Overseas companies may lack skills to enter a new marketplace. A way to overcome this gap is through alliances (partnerships or associations) with companies that can provide the necessary expertise. Alliances can take different forms, yet the notion of aggregating resources outside the firm boundaries remains unchanged.

In this regard, Doz and Hamel (1998) have stated that it is difficult for a company to have the resources and know-how to compete and win the race alone. Self-contained, vertically integrated companies are not the exception. Strategic alliances result as a "logical and timely response" to the rapid changes in technology and globalization. Alliances have become today's basis of global competitiveness and are considered part of the value creation process (Doz & Hamel, 1998)[40].

In the forest products industry, alliances have been recognized as essential for long-term success. For furniture manufacturing and marketing, the creation of strategic alliances has been considered a tactical issue for the US industry (Bullard & West, 2002).

[40] Although alliances can create immense wealth, they can also destroy more value than they have created. Partners' selection and alliance management have been identified by Doz and Hamel (1998) as key criteria for success.

Alliances are also of relevance for plantation timbers that enter new market segments (e.g. appearance eucalypt products). Particularly for non traditional products part of the future export success may depend on promotional efforts and allocation of products to the right place. The development of relationships with established and acknowledged local distributors overseas appears as a source of competitive advantage. Uruguay will, in a short time, face the challenge of marketing its eucalypt products overseas. The creation of alliances with overseas hardwood manufacturers and distributors "close to the market" is considered advantageous.

With the objective of illustrating the extent to which down-stream strategic alliances can create value to its member parts (allies), two cases studies of solidwood manufacturing companies that have gained market entrance through partnering are presented.

Aracruz and Weyerhaeuser partnership

The partnership between Aracruz Produtos Madeira (APM) and Weyerhaeuser (the international forest product company) began in May 2001. Since then, Weyerhaeuser has become the exclusive representative for APM Lyptus products: high grade *Eucalyptus* lumber, plywood and flooring in the international markets. A diagrammatic representation of Lyptus products supply chain is presented in Figure 6.9.

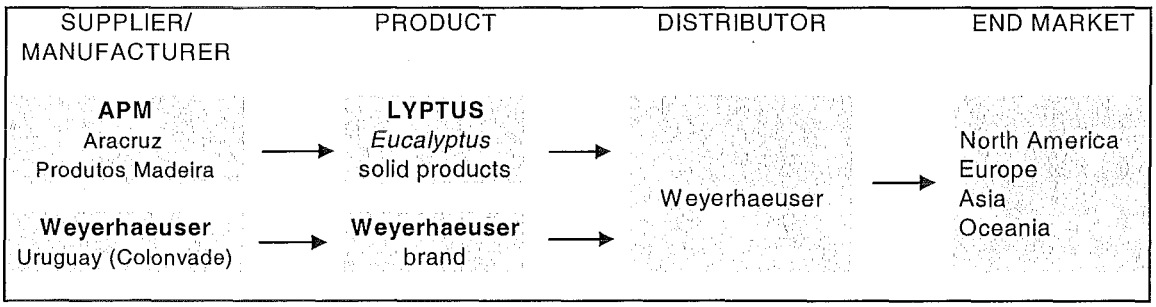

Figure 6.9 Lyptus products: supply chain diagram: 2001 – 2010

Note: Weyerhaeuser products from Uruguay, its distribution and end markets are a likely figure for the year 2010.

The partnership has given APM access to over 70 Weyerhaeuser distribution outlets in the US and Canada. As reported by APM (Aracruz, 2002) the partnership has been generating

good results, proof of which was the introduction of Lyptus solidwood strip flooring to the US market soon after the partnership was established (estimated exports were 500 m^3 in 2002 and around 4 000 m^3 in 2003)[41].

The US-based Weyerhaeuser company mission is characterized by "supplying building material solutions" to the world with softwood and hardwood products. The hardwood appearance wood products manufactured by Weyerhaeuser in the US, branded as Northwest Hardwoods, include hardwood lumber and components of 15 domestic hardwood species (the main ones are alder, red oak, hard maple, cherry and soft maple). Lyptus is being positioned as a new, "environmental" plantation hardwood alternative to pricier hardwoods such as cherry (30% cheaper) and Philippine mahogany (10% cheaper) (Weyerhaeuser, 2004).

Outside the North American markets, Lyptus products are offered in Europe and Asia through the Weyerhaeuser division Northwest Hardwoods (Maestri pers. com., 2004). The latest market expansion occurred in July 2004, when Lyptus entered Australia. Within Australia, Lyptus products are sold, distributed and marketed by the leading Australian company Pine Solutions, a Weyerhaeuser company with seven branches across the country (PineSolutions, 2004).

Tenon and Zenia House partnership

The Northland furniture collection exemplifies the positioning of clearwood radiata pine for interior design furniture in the European markets. The initiative is the result of a partnership between Tenon and Zenia House.

Tenon, when it was Fletcher Challenge Forests, was the second largest New Zealand radiata pine grower. The company forest resource was based in Taupo, North Island, and was FSC-certified. Tenon produces a wide range of industrial and appearance wood products for the New Zealand domestic market and the Australian, Asian, North American and European markets.

[41] Flooring produced by Indusparquet in Brazil under contract for APM.

Zenia House is a Danish solidwood furniture manufacturer and distributor. The company produces a number of furniture and accessory series (e.g. MayFlower, MaryAnn) for the living, sleeping, dining and bath interior segments. In 2004, Zenia House entered into a strategic alliance with Tenon to market Taupo Clearwood products in a new furniture-line branded as Northland in Europe. Tenon supplies the components from New Zealand (Taupo Clearwood) and Zenia House does the finishing and distribution of the flat-pack product (ready-to-assemble furniture) (*Zenia House*, 2004).

Figure 6.10 shows the supply chain of Taupo Clearwood from its starting point in New Zealand to target markets in Europe. The process, that begins with FSC-certified knot- free radiata pine wood, follows with the addition of sawn and wood laminating techniques, and results in the production of Taupo Clearwood and the development of an entire furniture collection branded as Northland. The collection features are solidwood, knot-free appearance products that can be surface lacquered with bright ("White Nature") or dark ("Expresso") finish. Taupo Clearwood products aim to appeal to environmentally conscious consumers in Europe. Tenon owns a 20% shareholding of Zenia House distribution (Tenon, 2004).

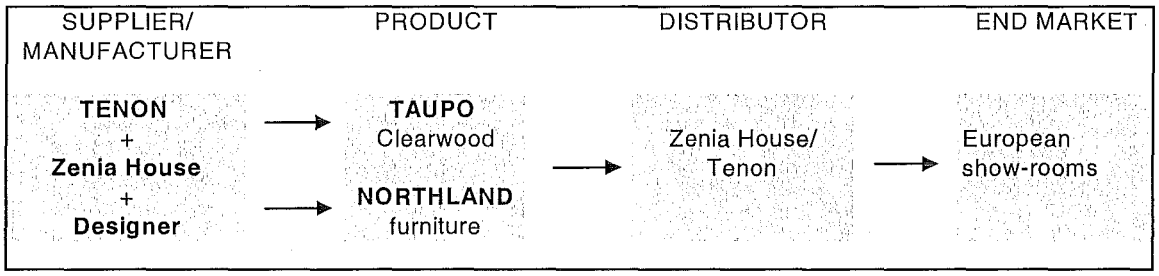

Figure 6.10 Taupo Clearwood: supply chain diagram.

6.5.2 Discussion of case studies

APM's choice of marketing Lyptus products outside Brazil through Weyerhaeuser has been successful (Aracruz, 2002). It exemplifies how APM instead of playing the game alone, chose a strategic partner for marketing its *Eucalyptus* products overseas. APM, by partnering with Weyerhaeuser, gains access to Weyerhaeuser's large distribution network, promotional programmes and, what is more, increases the understanding of its own products (products are being tested and analyzed in Weyerhaeuser's laboratory). Last but not least, APM gains export experience in marketing for customers in each market.

Because eucalypts are a lesser-known plantation hardwood species in the US, Europe and Asia, opening markets for Lyptus by APM on its own were too costly and too time consuming[42]. Conveniently for both partners (APM and Weyerhaeuser) direct competition within products in the commodity hardwood markets is avoided. Together, they have positioned Lyptus as an exotic and ecologically friendly hardwood alternative to US native hardwoods, tropical hardwoods and the re-growth eucalypts from Australia native forests.

The Tenon and Zenia House alliance to market New Zealand radiata pine in the European markets is a similar story. By partnering with Zenia House Tenon ensures its furniture components will be finished, distributed and marketed by one of the leading Scandinavian solidwood furniture manufacturers.

The two examples involve different products and markets, but both have a plantation resource owned by one company and the alliance with an import partner that adds the end-market expertise. Also, both examples relate to high quality clearwood (defect-free) solid products from fast-growing temperate species. In these case studies, exotic, high grade, non tropical woods are recurring product attributes.

[42] Prior the partnership, APM achieved limited success in its initial export marketing (Donnelly, pers. com., 2004).

6.5.3 How to apply it to Uruguay?

Opportunities may well exist for Uruguayan firms to increase their competitiveness in overseas markets through strategic alliances in the supply chain. Because Uruguay is a new hardwood player and *Eucalyptus grandis* is a lesser-known species alliances may be valuable for:

- becoming an insider and learning about unfamiliar local markets and end-users;
- accessing skills concentrated in overseas markets (e.g. furniture design skills in Italy/Denmark/Australia, gaining access to testing and materials that may be unavailable locally);
- accessing the allies distribution chain;
- entering the allies promotional campaigns;
- reducing the uncertainties of entering new product markets or geographic areas.

Choosing partner companies to trade is a difficult step. In this regard, governmental agencies may be of invaluable help linking export oriented companies with prospective overseas partners. The role of the government as a connector and adviser is considered highly important. The New Zealand Trade and Enterprise is an example of strong government export assistance.

Worldwide there is a changing nature of the channels of distribution. A key trend within the timber industry is for supply chains to be shortened (FAO, 2001). Alliances across the supply chain allow reducing the number of intermediate parts.

Some of the partnership possibilities for Uruguay include alliances between raw material suppliers and manufacturers, and alliances on product distribution (delivery channels) and marketing (marketing channels)[43].

[43] Distribution channel is defined as a channel through which information and products move between the producer and the user/customer/market. The distribution channels comprise the marketing channels through which information from and to the markets are channelled and through which the products are sold, and the delivery channels through which the products physically reach the customers (FAO, 1996).

Following APM-Weyerhaeuser and Tenon-Zenia House example, a strategic alliance between Uruguayan *E. grandis* manufacturers and key distributors in key end-markets is recommended as part of the product value addition process and sector development. Also, an alliance supplier/manufacturer may be applicable to companies that grow clearwood *Eucalyptus* in Uruguay and an overseas manufacturing company that has the production and sales know-how.

In the Asian region the demand for hardwoods is increasing, as it was discussed in Chapter 2. A number of Asian countries already import *Eucalyptus* sawn timber from Uruguay (Table 6.6). Among them, Vietnam and China are reported to have manufacturing facilities for the processing of *Eucalyptus* and increasing furniture production intended for re-export[44]. For the year 2002, the highest imports in terms of value for the Asian region were accounted for by Japan and Indonesia. However, the primary use of *Eucalyptus* timber in these two countries is for housing fit out and plywood production. Processing facilities for the manufacturing of *Eucalyptus* products in Japan and Indonesia have not yet been reported (Donnelly et al., 2003a).

Table 6.6 Uruguayan exports of *Eucalyptus* sawn timber by country of destination in Asia (exports in US$).

Country (Number of companies that manufacture *Eucalyptus* furniture)	**Exports for 2002 (US$)**
Japan	750 550
Indonesia	721 848
Taiwan	287 932
Vietnam (6)	157 741
China (1)	22 513

Source: Export values were extracted from Rimoldi (2003); furniture companies by country from Donnelly et al. (2003a).

It is interesting to note that Indonesia started imports of *Eucalyptus* timber from Uruguay in the year 2001, and the subsequent year imports were significantly higher, 11 times up in

[44] Thailand has also imported eucalypt timber from Uruguay, yet not in the year 2002. Thailand also produces *Eucalyptus* furniture, MDF and hardboard.

value. Likewise, China (a leading importer of hardwood sawn wood) started to import *Eucalyptus* sawn timber from Uruguay in the year 2002, and is expected to increase its imports as well (Sadaaki, 2004).

Vietnam is one of the countries that has rapidly expanded its furniture production and is moving fast to supply the European and US market with *Eucalyptus* garden furniture. The Vietnamese forest products industry has large plans for export development. Proof of this is the official forecast of 43% forest products export growth estimated for the period 2003-2004. Production expansion is expected to be achieved through overseas raw material imports (including distribution alliances) while the Vietnamese plantation-grown *Eucalyptus/Acacia* resource is developing. Supplier countries are finite and include *Eucalyptus* from the Solomon Islands, South Africa, Brazil and Uruguay (Donnelly & Ogle, 2004).

Vietnamese interest in establishing a supply flow with Uruguayan *E. grandis* growers has already manifested (Robert Donnelly, pers. comm., 2004). If a supply agreement takes place, options are whether the manufacturing plants will be installed in Uruguay or in Vietnam. A common option might be the production of furniture components in Uruguay to be finished in Vietnam and exported into a Tenon/Zenia House type of distribution network.

Features of the Asian countries are increased demand for logs and sawn timber (i.e. import of raw material from a limited number of grower countries), low labour costs, and industry and trade development in the global hardwood markets with eucalypt products mean that it will become difficult for non-Asian *Eucalyptus* manufacturers to compete successfully. A supply-manufacture alliance between Uruguay and key Asian manufacturers like from Vietnam and China could be of mutual benefit in developing value-added, high quality, resource content with a joint distribution product network.

6.6 PROMOTION STRATEGY

This section presents recommendations regarding the promotion of Uruguayan *Eucalyptus grandis* solidwood products. It stresses the importance of government and industry to join efforts for presenting the nation's species in overseas markets and recommends focusing on the promotion of intangible product attributes. The promotion of *Eucalyptus* products should be part of a "Buy Uruguay" programme emphasizing natural beauty, pastoral, agricultural, environmentally friendly, stable and secure country.

6.6.1 The importance of promotion

Promotion is a major marketing factor that should be effectively used in accessing markets for *Eucalyptus* solidwood products. Promotion can stimulate product demand, develop product awareness and provide product comparisons between the promoted products and the competitor's products (Kotler & Armstrong, 2004). The timber industry in general is starting to realize the importance of promotion of their products (FAO, 2001). For a lesser-known species more important than product involves country intangibles and national promotion programmes.

6.6.2 NZ Merino case study: an example of product intangibles promotion

The New Zealand Merino Company Ltd. (NZ Merino) developed a distinctive wool concept that features a combination of core product attributes and "natural" surrounding environment attributes (country image) (Figure 6.11). Indeed, NZ Merino fibre promotional programme (Champion pers. com., 2004) is focused on two topics:

1. Intangibles promotion = first promote NZ as a country. This gives a background to the product. Translate the message that NZ is "the country of Merino";
2. Tangibles promotion = promote the core product (Merino fibre) attributes and benefits by providing technical information on the fibre and product suitability. The company looks for product differentiation though focusing on Merino fibre points of difference with other fibres (e.g. comparison between Merino and synthetics). Indeed, non wool fibres have proven to be the most important competitors.

Figure 6.11 The New Zealand Merino story: highlights of the marketing programme

NZ Merino fibre delivered on its promise to provide the *worlds leading* top makers, spinners, knitters and weavers *high quality processing attributes*

The *inherent romance and drama* of the NZ Merino story, with its spectacular *environmental backdrop* and *strong personal dedication of New Zealand's Merino growers*

The *rare quality* of NZ Merino, as scarce as cashmere, and reflecting its growing environment

Establishing *direct relationships with leading brands* in the fashion world, both by taking NZ Merino to the world and by bringing people to New Zealand to see for themselves the source of the superb fibre

Innovative marketing techniques include extensive use of computer and inter-active technology to *bring the NZ Merino story to life for customers overseas*

Source: NZ Merino company information.

It is interesting to note that NZ Merino has developed a strong brand and does not use the word "wool" in its promotional material. This reflects the company's intention to run a different race, without being identified with the national and international wool history. Similar to *Eucalyptus grandis*, that covers a wide range of product applications (traditionally fuel and pulp), the Merino fibre has a previous story. However, when a product features different attributes (e.g. quality, environmental concern) it is crucial to clearly differentiate it. The word "wool" and "*Eucalyptus*" used as part of the brand name (and promotional material) mislead in both cases the new product concept. As was previously discussed in the Branding section, it is recommended that the Uruguayan *E. grandis* industry avoid the word "*Eucalyptus*" when marketing its high quality, knot-free, appearance products in international markets.

6.6.3 A promotional campaign for Uruguayan timbers

Fast growth *E. grandis* is a lesser-known species and Uruguay a new producer. The country lacks a solidwood eucalypt export tradition and promotional efforts become essential for the creation of product awareness and international demand. Some combination of push and pull promotion strategies will likely be required[45].

Promotion programmes based upon product research (in part government funded) should be specifically designed to inform and educate the intended recipients: end-users, building merchants, architects, etc. Above all, it is important to select the media[46] and messages for the promotional programme. Depending on the audience to be targeted different media will be used (e.g. scientific and trade journals for disclosing technical information to professionals vs. magazine advertisements for the general public). Also, the information to disclose will vary. While finished product attributes and maintenance may be important for end-users, wood workability and supply factors may be relevant to processing industries. Language and cultural barriers should also be considered. Recommended types of wood product promotion include international trade fairs, product shows (e.g. interiors furniture shows), catalogues, magazine advertisements and Internet web pages amongst others.

The future promotion of solidwood *Eucalyptus* products should be a cooperative effort by industry (companies and industry federations) and government. It is recommended that a promotional campaign introduces the plantation timbers as part of a Uruguayan export promotion programme to reach international markets. In this regard, not only the timber attributes should be promoted but also the product intangibles (e.g. wood as a renewable and recyclable material within a secure and friendly environment).

All products have aspects of the tangible and the intangible. To know what these are and how to enhance and manage them gives a differential competitive power (Levitt, 1986). The environmentally friendly condition of the country (as a whole, i.e. landscape, natural resources, activities, people) should be considered as a pervasive competitive advantage

[45] A **push strategy** involves "pushing" the product through distribution channels to final consumers. Under this strategy, the producer directs its marketing activities toward channel members to induce them to carry the product and to promote it to final consumers. Using a **pull strategy** the producer directs its marketing activities toward final consumers to induce them to buy the product. Consumer demand "pulls" the product through the channels (Kotler & Armstrong, 2004).

[46] The media represents the connection between the audience and the message.

for the forest wood products industry[47]. Effective programmes need to be developed for the promotion of Uruguayan timbers. Export promotion programmes should aim to increase public awareness overseas and demand for the country's wood products while addressing the national broader attributes:

- Country image: "Green" or "natural" country- a traditional agricultural and cattle grower with a strong respect for the land and its people; beaches and rural areas are international tourism attractions; living history[48]
- Plantations established in selected areas: low fertility regions of the country where forestry yields are better than other agricultural activities
- Plantations do not replace indigenous forests
- Species: fast growing exotic species; species selection based on site conditions
- Management: short rotation regimes that seek to obtain quality wood with regimes varying by species and intended final use, generally ranging from 16 to 24 years
- Sustainability/environmental perception: respect for the environment, flora and fauna monitoring programmes; responsibly produced wood products with increasing presence of FSC certification accrediting sustainable forest management system and chain of custody
- Social issues: no conflict with local communities; forestry in Uruguay employs more people per hectare than other agricultural activities; creation of development poles and job opportunities where forest plantations and industry are concentrated
- Government support has helped the initial development of the sector giving incentives for the establishment of selected species in selected soil regions

Export promotion programmes can cover both pine and eucalypt timbers together (i.e. a Uruguayan plantation wood products promotion) or be conducted separately for each particular genus, group of species or intended final use. Regardless of the case, the national scope of the promotion will be a good precedent for individual product promotion (private company product promotion).

[47] This is true for other sectors too.
[48] No battles or catastrophic events in the past.

6.6.4 Examples of local timber promotion campaigns

Hawaii, the United States (US), Malaysia and New Zealand (NZ) are countries that exemplify investment efforts in local timber promotion. The Hawaii trademarked branding campaign "Hawaii's Wood" was launched by the Hawaii's Forest Industry Association in 2001. The campaign sought to promote the local forest and wood products industry by creating public awareness about the woods grown in Hawaii and the quality of the value-added wood products made in the country ("Hawaii's forest industry launches branding campaign," 2001).

The US organization American Hardwood Export Council (AHEC) is another example of nationwide wood promotion. AHEC runs a worldwide programme to promote American hardwoods in over 50 export markets. The organization is regarded as being highly successful in promoting timbers in Europe and has considerably increased the market share of American hardwoods in that market.

The Malaysian Timber Council (MTC) has also undertaken promotional campaigns to promote Malaysian species. Regarding the way lesser-known species were promoted by the MTC it is worth noting that the promotion of species under umbrella names (i.e. grouping species together under a single title, e.g. "red merantis") has been reported to be a failure as end-users get disappointed with the variability in properties within the group timbers (FAO, 2001).

In NZ, a native hardwoods network was created for the promotion of the indigenous beech (*Nothofagus spp.*) timbers (Donnelly pers. comm., 2004). The network of participants and supporters include a select group of hardwood forest products suppliers, forest owners, researchers and governmental groups. These groups have been working together to develop effective forestry and market programmes to support the ongoing sustainable management of New Zealand's native hardwood beech forests. The organizations' web page http://www.nativehardwoods.co.nz presents NZ's native hardwood resources, with information on the timber properties and the network members.

6.6.5 Concluding notes on promotion

Investment efforts for the promotion of *E. grandis* value-added solidwood products become essential for Uruguay. A combination of push and pull promotion strategies will be required. To begin with, the creation of a Uruguayan timber promotion programme is recommended. This will seek to increase global consumers' awareness (pull strategy). Afterwards, when individual companies reach the point of marketing their *E. grandis* products, a promotion strategy that involves pushing the product(s) through sales channels will be needed (this resembles the marketing of APM eucalypt products –Lyptus– through Weyerhaeuser).

An international recognition of Uruguay as a sustainable grower of quality timbers should be sought. It is suggested that industry organizations and government agencies work together to launch a "country and timber story" to communicate the environmental friendliness of Uruguayan wood products to the international markets. The national promotion programme can cover the entire Uruguayan plantation-grown timbers (pine and eucalypt species) or alternatively each of the single genus or sole species. The inherent green country image should be considered a competitive advantage and thus be strategically exploited for promotional purposes. If this is accomplished in a short to medium time it would likely be a positive starting point for the export oriented *E. grandis* solidwood products industry.

CHAPTER 7 GENERAL DISCUSSION AND CONCLUSIONS

The theoretical marketing framework provided an adequate conceptual structure for analysing the Uruguayan *Eucalyptus* solidwood situation. For basic commodity producers such as Uruguay with sawn timber exports, marketing provides a rationale for differentiating commodity products to meet particular customer needs and to stand apart from the competitors.

The market leader will likely be Weyerhaeuser (Colonvade and Los Piques in Uruguay) with a successful marketing and distribution programme for Lyptus, *Eucalyptus* sawn timber products, from Aracruz Produtos Madeiras -APM- in Brazil (as discussed in Chapter 6). This experience will assist Weyerhaeuser develop product-market applications for its plantations in Northern Uruguay, the study region. It could help guide others in the industry and the government in providing appropriate support to the sector.

The research study was limited to *E. grandis* pruned log producers. Pruned *E. grandis* is the only practical alternative for *Eucalyptus* solidwood producers. One of the limitations of the research is that recommendations do not consider the prospects for other *Eucalyptus* species plantation owners. There are other species to consider in the broader context of the country plantation-base, including other eucalypt and pine species.

In addition to the specific company considerations for future new entrants and smaller landowners, there are company/industry-marketing issues and government considerations. These issues, which have been raised and are beyond the scope of the current research are summarised below for each organisation:

Government issues. The problem and opportunity is that the government has been active establishing a plantation forest base over the past 15 years. As presented in Chapter 3 this involved government planting incentives for the plantation forestry sector. The benefit included creating rural employment, improving environmental conditions and relatively low-production costs by international standards.

Eucalyptus has been the major species and 100 000 hectares of *E. grandis* are managed for sawlog products. Industrialization of the forestry sector is expected to expand, with international-scale participants playing an important role. In part this has been guaranteed by government commitments to allow the duty-free importation of wood products processing equipment. This duty-free situation is a competitive advantage for Uruguay. But the government has not helped the industry invest in product marketing activities or in trade assistance.

Company/industry issues. Forestry companies, possibly, aside from Weyerhaeuser, are facing the challenge of being new market entrants and part of a non-traditional sector. Uruguayan forest exports now are commodity products, with prices driven by the international market. However, at the same time, Uruguay leads the world in intensively managed *E. grandis* plantations in the study region of Northern Uruguay. This resource presents great product/market opportunities for high-value utilization options, as shown in Chapter 6.

Company/industry and government issues. Given all of the advantages, industry and government marketing activities have been minimal. Trees are growing and now attention involves processing facilities and infrastructure. Marketing these forest products has received no attention with the possible exception of Weyerhaeuser, but so far related to Brazilian products (Lyptus). This marketing strategy deficiency is the result of a lack of national forest tradition, a commodity product orientation and the absence of strong government export assistance (such as NZ Trade and Enterprise).

As indicated in Chapter 1, strategic marketing for *Eucalyptus* solidwood products appears critical for the successful development of the sector and has been missed out. This study addressed, for a regional area, the wood products strategic marketing requirements as an introductory first step for the successful processing of the *E. grandis* plantation resource in Northern Uruguay. The most important wood products aspects involve value-adding through product differentiation.

7.1 Strategic marketing

Strategic marketing, as addressed in Chapter 6, includes the following recommendations:

- Product mix alternatives including wooden flooring (solid and engineered), mouldings, garden furniture and interior furniture. One of the major processing topics is the sorting of the lumber to ensure superior product performance. This follows APM lumber density sorting to meet product requirements.
- Product certification as a prerequisite for lesser-known species. Also a competitive advantage. Particularly important for market entrance to US and Europe niche markets.
- "Value for money" proposition to position products at the desired level.
- Branding as a strategic way to differentiate *Eucalyptus* products in export markets.
- A market base pricing policy derived from preferred and similar "benchmark" hardwoods.
- Strategic partnerships to build market position and reduce business risks.
- Promotional activities to generate product demand, such as a "Buy Uruguay" hardwood programme.

7.2 Proposed research and marketing activities

Both the government and industry need to invest in marketing and marketing activities to ensure sector viability with differentiated, value-added, products and companies. It is an essential ingredient to success in value extraction from prior government investments in planting and duty assistance. This includes government funded research programmes for basic research and university level programmes in forest products marketing. This section outlines several specific proposals that emerged from this study.

1. Government Wood Products Marketing Study

This study would investigate extracting value from the plantation resource. It should be a larger version of this thesis and expanded to include other regions and other species. It would consider the solidwood alternatives and value-adding options. The

important part is to evaluate the strategic marketing requirements and the role of the parties, industry and government. This could recommend specific trade related marketing as Trade Uruguay.

Despite the lead time for the plantations, with intensively managed stands to mature in four years, the international evidence supports an early start.

2. A *Eucalyptus* Wood Supply and Demand Study

This would include a national forecast of *E. grandis* sawlog supply, including volumes for different sawlog classes. This will be valuable for forecasting product volumes, demand and their volume profiles over time (e.g. for flooring production, furniture parts, door/window frames). A similar study should be considered for the pine plantations.

3. Industry/ Government Networking and Web-Site

Industry networking to support government initiatives and research programmes, including market research in export markets. Possibly, workshops should be put on to encourage information exchange on marketing topics. The first step could be an industry/government web site linking together the various segments: growers, manufacturers and customers. This would provide informal communication between the programme participants, similar to the NZ native hardwood forests network established in 2004 (http://www.nativehardwoods.co.nz). It can be used to attract overseas customers and investors.

4. Industry Research Programmes

Research institutes and company product development research as outlined in chapter 6. This includes a deeper understanding of the wood properties through the assessment of *E. grandis* wood properties in different site soils, tended under different regimes and at different ages. There also are opportunities to improve processing and product quality, including grading standards. Possibly, there are construction and design topics to consider.

5. Company Marketing Programmes

Company appraisals of market opportunities and specific product research to confirm product standards and market acceptance. There is a requirement for the individual companies to develop marketing programmes.

7.3 Concluding note

Despite the remaining issues, the conclusion of the marketing analyses and projections is favourable for *Eucalyptus grandis*, accepting that it is a small segment of the *Eucalyptus* plantation resource in Uruguay. Based upon the research and analyses, there is potential to achieve value-added wood products (SPWP) and export market success.

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Appendix 1

Growth rates for plantation-grown *Eucalyptus*

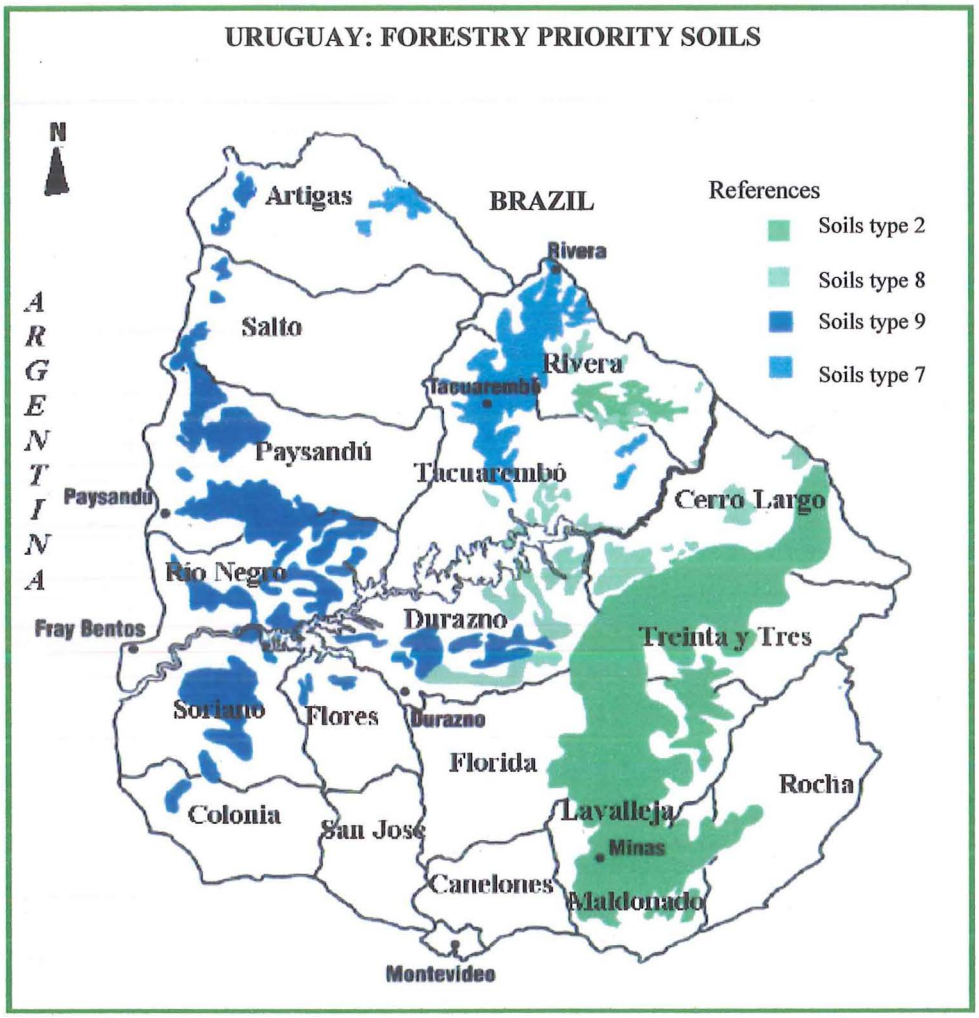
Indicative forest plantation yields for *Eucalyptus spp.* by country.

Yield (m^3/ha/year)	Countries
16.0 - 25.0	Argentina, Brazil, Chile and Uruguay
12.0 - 19.0	Australia, Rep Congo, Malawi, Papua New Guinea, South Africa, Swaziland, Uganda, Zambia and Zimbabwe
8.0 - 12.5	Burundi, China, Colombia, DR Congo, Costa Rica, Cuba, Ecuador, El Salvador, Ethiopia, Gabon, Guatemala, Kenya, Madagascar, Mauritius, Nicaragua, Nigeria, Pakistan, Paraguay, Peru, Philippines, Solomon Islands, Tanzania, Thailand and Venezuela
6.5 - 10.0	Malaysia and Sierra Leone
4.0 - 6.0	Algeria, Angola, Bangladesh, Benin, Bolivia, Burkina Faso, Cameroon, Cape Verde, Chad, India, Indonesia, Laos, Lesotho, Mali, Morocco, Mozambique, Myanmar, Namibia, Nepal, Niger, Rwanda, Senegal, Sri Lanka, Sudan, Togo, Tunisia and Vietnam

Source: FAO (2000).

Appendix 2

Map of Uruguay with location of forestry priority soils and departments



Appendix 3

Eucalyptus plantation-grown resource in Uruguay: area by species and departments

Department	*E.grandis*	%	*E.globulus*	%	others	%	TOTAL	%
ARTIGAS	136	0.09	9	0.00	9	0.0	**153**	0.04
CANELONES	1 107	0.73	2 598	1.04	40	0.2	**3 745**	0.88
CERRO LARGO	11 704	7.69	9 718	3.89	332	1.5	**21 753**	5.13
COLONIA	486	0.32	645	0.26	317	1.4	**1 448**	0.34
DURAZNO	14 082	9.26	15 876	6.36	2 106	9.3	**32 064**	7.56
FLORES	237	0.16	211	0.08	-	-	**447**	0.11
FLORIDA	323	0.21	25 592	10.26	27	0.1	**25 942**	6.12
LAVALLEJA	1 323	0.87	60 736	24.34	562	2.5	**62 621**	14.76
MALDONADO	363	0.24	16 122	6.46	219	1.0	**16 704**	3.94
MONTEVIDEO	39	0.03	41	0.02	12	0.1	**92**	0.02
PAYSANDU	28 511	18.74	25 422	10.19	1 754	7.8	**55 687**	13.13
RIO NEGRO	35 992	23.66	24 067	9.64	11 477	51.0	**71 536**	16.86
RIVERA	38 091	25.04	1 273	0.51	1 195	5.3	**40 560**	9.56
ROCHA	245	0.16	17 127	6.86	61	0.3	**17 433**	4.11
SALTO	571	0.38	-	-	-	-	**571**	0.13
SAN JOSE	169	0.11	1 224	0.49	130	0.6	**1 522**	0.36
SORIANO	4 229	2.78	17 187	6.89	1 479	6.6	**22 895**	5.40
TACUAREMBO	13 754	9.04	26 601	10.66	2 700	12.0	**43 055**	10.15
TREINTAyTRES	770	0.51	5 096	2.04	103	0.5	**5 969**	1.41
TOTAL	**152 131.55**	**100**	**249 544.17**	**100**	**22 523.2595**	**100**	**424 198.98**	**100**

Source: Dirección General Forestal (2003).

Appendix 4

Moisture content ranges for some wood products

The following table is an example of allowable moisture contents for different wood products when installed in buildings under different humidity conditions. On a broad sense, moisture content of timber intended for heated buildings is lower than the one intended for unheated buildings.

Moisture content (MC) ranges for wood products to be installed in New Zealand residences.

	FLOORING exposed to ground atmosphere (MC %)	FLOORING not exposed to ground atmosphere, INTERIOR JOINERY and FURNITURE (MC %)
Air- conditioned or centrally-heated buildings	10 - 14	8 - 12
Intermittently heated buildings *	12 - 16	10 - 14
Unheated buildings	14 - 18	12 - 16

Note: * Buildings periodically heated by open fires, electric heaters, other heat appliances.
Source: New Zealand *Code of Practice for Specifying Timber and Wood-based Products for use in Building* (1975) cited by Clifton (1994).

Appendix 5

What do customers perceive as important attributes in wooden furniture?

The importance of different wooden furniture attributes varies with end market. Several studies have assessed the product attributes that influence consumers' purchase decisions for furniture segments in different markets. An initial literature review on this topic showed that quality, style, certification and species are major attributes for consumers.

Wooden outdoor furniture preferences in New Zealand & Australia

Surveys conducted by Bigsby and Ozanne (2003) in New Zealand and Australian consumers have assessed the regional importance of five wooden outdoor furniture attributes: price, forest certification, warranty, type of forest and country of origin. Results showed that timber source, forest type and certification were the first factors that influenced purchase. After these three factors, warranty and price followed in importance. It is important to note that of the five product attributes that were studied price was ranked last in both countries.

Wooden household furniture preferences in Finland

A Finnish study assessed 15 furniture related attributes for the wooden household furniture categories solid, plate and upholstery furniture. Quality and design were ranked as the most important attributes in all categories. Material, service and price were the next three attributes in solidwood and upholstery furniture (Pakarinen & Asikainen, 2001).

Wooden furniture attributes in Germany

A study conducted in Southern Germany (Kärki, 2000) determined the factors that were highlighted in national wooden furniture advertisement. Of 15 product factors furniture design was ranked first, followed by species. Price was ranked third. Practicality, green attributes and quality were the next attributes. These six attributes were largely utilized in promotions (85% frequency). It is worth noting that quality was ranked after green attributes.

Hierarchical order of attributes importance in a choice situation for selected countries

Product: WOODEN FURNITURE				
Product type:	Garden furniture			
Country:	NEW ZEALAND		AUSTRALIA	
Ranking of assessed attributes- in decreasing order of importance (average importance %)	Timber source [49]	(26.0)	Forest type [50]	(24.3)
	Forest type	(21.5)	Certification	(22.0)
	Certification	(20.7)	Timber source	(21.5)
	Warranty	(19.9)	Warranty	(19.6)
	Price	(11.9)	Price	(12.7)

Country:	FINLAND		
Product type:	Solidwood furniture	Plate structure furniture	Upholstery furniture
Ranking of assessed attributes- in decreasing order of importance (from very important to important)	Quality	Quality	Quality
	Design	Design	Design
	Material	Price	Material
	Service	Service	Service
	Price	Material	Price
	Terms of payment	Terms of payment	Terms of payment
	Domestic	Domestic	Domestic
	Finishing	Finishing	Finishing
	Employ in homeland	Employ in homeland	Employ in homeland
	Ecological image	Lumped	Lumped
	Lumped	Ecological image	Ecological image
	Recycling	Recycling	Brand name
	Brand name	Brand name	Recycling
	Style	Style	Style
	Advertising	Advertising	Advertising

[49] Domestically sourced timber preferred over imported
[50] Plantation sources preferred to native forest sources

Product: WOODEN FURNITURE cont.		
Product type:	All segments (outdoor/indoor; solid/partly solid/composite furniture)	
Country:	GERMANY	
Ranking of assessed attributes- in decreasing order of importance (average importance %)	Design	(28.2)
	Species	(18.7)
	Price	(14.9)
	Practicality	(10.0)
	Green attributes	(7.2)
	Quality	(5.9)
	Finishing	(4.8)
	Selection	(2.7)
	Extra equipment	(2.5)
	Durability of material	(2.4)
	Stable construction	(0.9)
	Comfort	(0.9)
	New product	(0.4)
	Material	(0.2)
	Guarantee	(0.2)

New Zealand and Australian data sourced from Pakarinen & Asikainen (2001)
Finnish data sourced from Bigsby & Ozanne (2003)
German data sourced from Kärki (2000)

Appendix 6

NHLA

National Hardwood Lumber Association - general requirements for factory lumber grades (United States)

GRADE	CUTTINGS	WIDTH	LENGTH
First	91 2/3% clear	5 inches +	8-16 feet (max. 15% 8 and 9 foot)
Seconds	83 1/3% clear	6 inches +	8-16 feet (max. 15% 8 and 9 foot)
Selects	91 2/3% clear	4 inches +	6-16 feet (max. 5% 6 and 7 foot)
No. 1 Common	66 2/3% clear	3 inches +	4-16 feet (max. 5% 4 and 5 foot)
No. 2 Common	50% clear	3 inches +	4-16 feet (max. 10% 4 and 5 foot)
No. 3A Common	33 1/3% sound	3 inches +	4-16 feet (max. 25% 4 and 5 foot)
No. 3B Common	25% sound	3 inches +	4-16 feet (max. 25% 4 and 5 foot)